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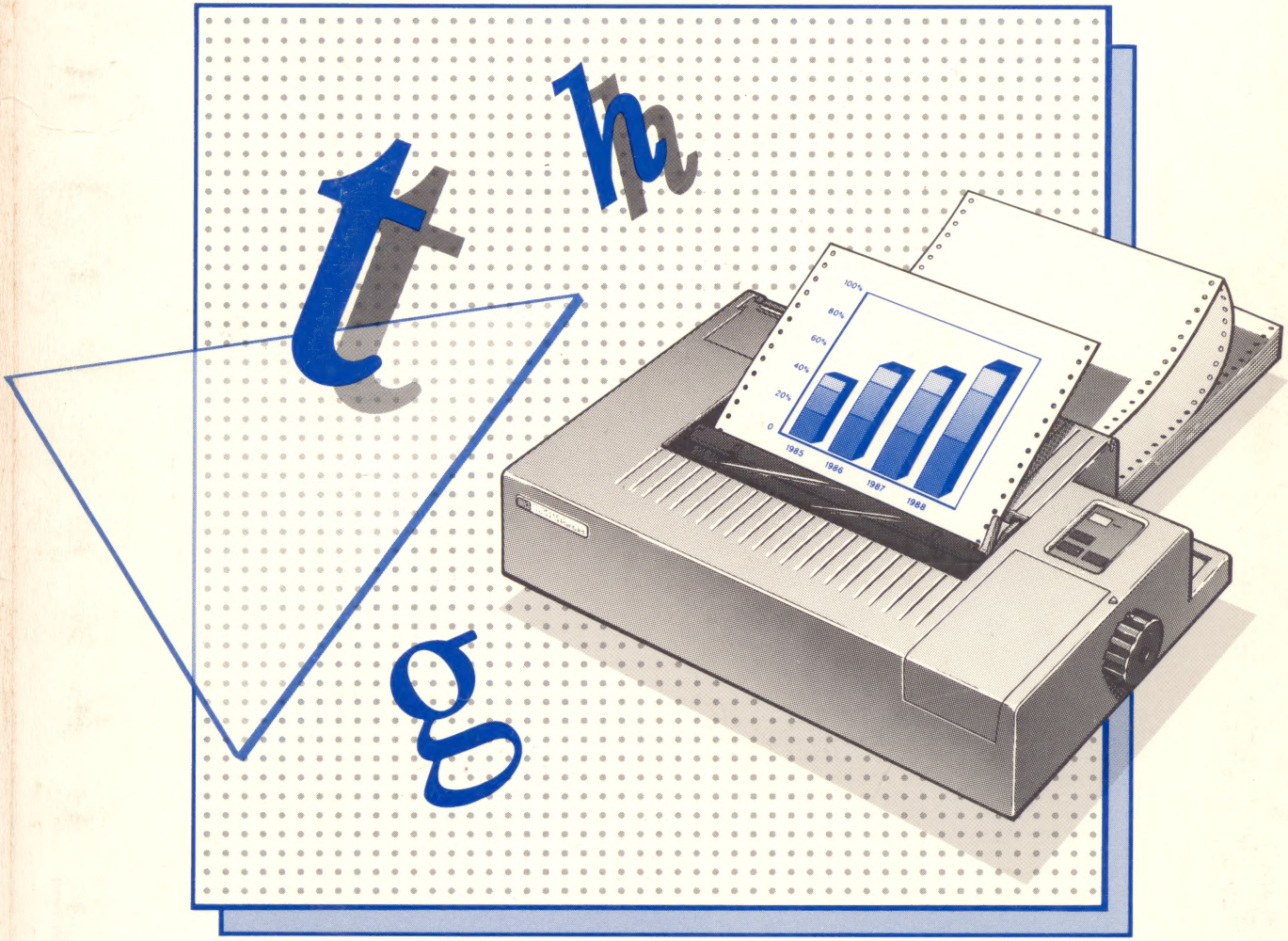
HP PaintJet Color Graphics Printer User's Guide



HP PaintJet Color Graphics Printer User's Guide

The United States Federal Communications Commission (in 47 CFR 15.838) has specified that the following notice be brought to the attention of users of this product.

FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

"This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. Shielded data cables were used during the type test; therefore, properly shielded and terminated data cables should be used to reduce potential interference. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

— reorient the receiving antenna
— relocate the computer with respect to the receiver
— move the computer away from the receiver
— plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

'How to Identify and Resolve Radio-TV Interference Problems'.

This booklet is available from the US Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4."

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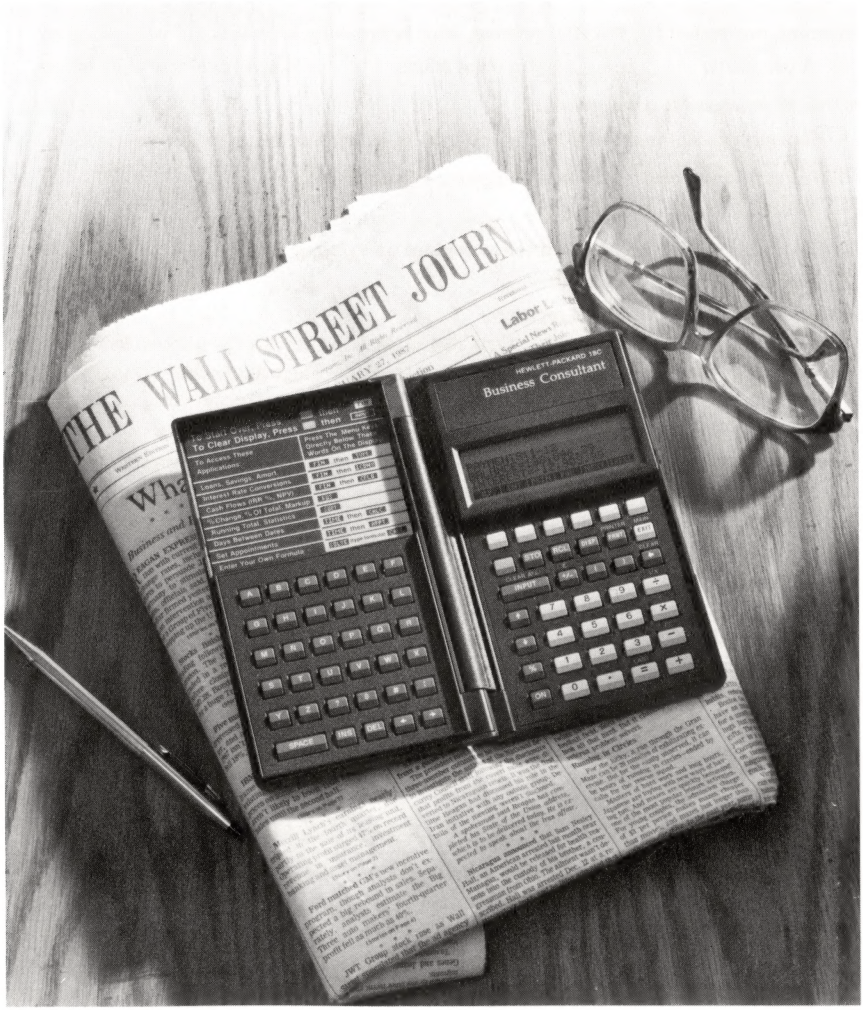
You Could WIN an HP Calculator



U.S./English

HP wants to know what YOU think!

You're the key — the information you provide will help us to understand your graphics needs. In the past, this information has led us to improve software support, to add features to our existing products, and to change features on our future products. We will also put you on a mailing list for future products and product enhancements.

To enter the calculator drawing, simply return this postage-paid reply card. We're giving away 4 calculators each month. Winners can choose HP 18C Business Consultant Calculator or a HP 28C Scientific Professional Calculator.

User's Name _____

Department/Mail Zone _____

Company/Division _____

Street Address _____

City _____ State _____ Zip _____

Country _____

Area Code _____ Telephone _____ Extension _____

If I win a calculator, I would prefer:

☐ HP 18C Business Consultant Calculator

☐ HP 28C Scientific Professional Calculator

1. **What brand of computer are you using with your HP PaintJet printer?**
   - a ☐ Apple
   - b ☐ AT&T/Olivetti
   - c ☐ Compaq
   - d ☐ DEC
   - e ☐ Epson
   - f ☐ Fujitsu
   - g ☐ Hewlett-Packard
   - h ☐ IBM
   - i ☐ NEC
   - j ☐ Other (specify) _____

2. **What type of computer environment (computer system) is it? Check one.**
   - a ☐ Personal computer which can access a mini or mainframe
   - b ☐ Personal computer which can access other personal computers on a local area network (LAN)
   - c ☐ Stand-alone personal computer
   - d ☐ Engineering workstation
   - e ☐ Terminal to mini or mainframe
   - f ☐ Other (specify) _____

3. **Is this personal computer, workstation, or terminal mainly for your own use; or do you share it with others?**

   Own _____ Shared _____

   How many people use it? _____

4. **What types of software do you plan to use with your HP PaintJet printer?**
   - a ☐ Word processing
   - b ☐ Desk-top publishing
   - c ☐ Database
   - d ☐ Business graphics
   - e ☐ Spreadsheet
   - f ☐ CAD/CAM/CAE
   - g ☐ Electronic mail
   - h ☐ User-written
   - i ☐ Other (specify) _____

5. **Of these, write the letter corresponding to the ONE software type that you plan to use MOST often with the HP PaintJet printer** _____

6. Where did you learn of this printer? Check all that apply.

a ☐ Associate or co-worker
b ☐ Came with computer/workstation
c ☐ Company equipment list/Management Information System (MIS) dept.
d ☐ Conference/show
e ☐ Consultant
f ☐ Dealer/computer store salesperson
g ☐ HP catalog
h ☐ HP sales representative
i ☐ Mail
j ☐ Magazine advertisement
k ☐ Magazine article
l ☐ Non-HP sales representative
m ☐ Previous experience with HP PaintJet
n ☐ Other (specify) _____

7. Of these, write the letter of the ONE source that was the MOST influential in your decision to purchase the HP PaintJet printer _____

8. Where did you purchase your HP PaintJet printer?

a ☐ Direct from Hewlett-Packard
b ☐ Dealer or computer store
c ☐ MIS department/in-house store
d ☐ Mail order
e ☐ Don't know
f ☐ Other (specify) _____

9. Did you purchase this printer at the same time you bought your computer?

10. When you purchased the PaintJet printer, what other output devices did you consider?

a ☐ A pen plotter b ☐ Another color printer c ☐ A black-and-white printer

11. Do you have access to a pen plotter?

a ☐ Yes b ☐ No

12. Will this printer be used with your computer/terminal ONLY?

a ☐ Yes b ☐ No

13. Did you buy your HP PaintJet printer to replace an existing printer?

a ☐ Yes b ☐ No

If yes, what type of printer did you replace?

a ☐ Laser printer
b ☐ Impact dot matrix — 9 wire
c ☐ Impact dot matrix — 18 or 24 wire
d ☐ Daisy wheel
e ☐ Ink jet
f ☐ Thermal transfer
g ☐ Other (specify) _____

14. Do you have another personal printer which is ONLY used with your computer/workstation?

a ☐ Yes b ☐ No

If yes, what type of printer is this?

a ☐ Laser printer
b ☐ Impact dot matrix — 9 wire
c ☐ Impact dot matrix — 18 or 24 wire
d ☐ Daisy wheel
e ☐ Ink jet
f ☐ Thermal transfer
g ☐ Other (specify) _____

15. Other than the HP PaintJet printer, are there other printers that you can use from your computer/workstation, which other people can also use from their computer/workstation?

a ☐ Yes b ☐ No

If yes, how is that accomplished? Check all that apply.

a ☐ I'm not sure
b ☐ From my personal computer through a *switch box, spooler,* or *buffer* to a printer in my department
Brand _____ Model _____
c ☐ From my personal computer through a *local area network* to a printer in my department
Brand _____ Model _____
d ☐ From a mini/mainframe to a *printer in my department*
Brand _____ Model _____
e ☐ From a mini/mainframe to a *line printer in the computer room*

16. How important were the following attributes in your decision to purchase the HP PaintJet printer?

Circle the number corresponding to the level of importance for each attribute listed below.

	Not Important				Very Important
a Ability to create color overhead transparencies	1	2	3	4	5
b Ability to add color graphics to reports, letters, or memos	1	2	3	4	5
c Hewlett-Packard reputation	1	2	3	4	5
d Text print quality	1	2	3	4	5
e Graphics output quality	1	2	3	4	5
f Price	1	2	3	4	5
g Quiet operation	1	2	3	4	5
h Reliability	1	2	3	4	5
i Service support	1	2	3	4	5
j Other (specify) _____	1	2	3	4	5

17. Of these, write the letter of the ONE attribute that was the MOST important _____

18. What applications do you use with the HP PaintJet printer? Check all that apply.

WORD PROCESSING (Text only)

a ☐ Rough drafts
b ☐ Memos
c Business or technical reports
d Business letters

BUSINESS GRAPHICS

e ☐ Create reports with graphs or charts
f ☐ Create presentation handouts with graphs or charts
g ☐ Create overhead transparencies
h ☐ Other business graphics (specify) _____

CAD/CAM/CAE AND ENGINEERING DRAWING

i ☐ Architectural drawings
j ☐ Electrical engineering drawings
k ☐ Maps
l ☐ Mechanical engineering drawings
m ☐ Other drawings (specify) _____

What type of drawing will you make? Check all that apply.

WORKING DRAWINGS

1. ☐ 2D
2. ☐ 3D line drawings
3. ☐ 3D solids

FINAL COPY

1. ☐ 2D
2. ☐ 3D line drawings
3. ☐ 3D solids

OTHER

n ☐ Scientific analysis/measurement
o ☐ Other (specify) _____

19. Of these, write down the ONE letter which BEST describes you PRIMARY application for the HP PaintJet printer _____

20. How many employees work at your facility?

a ☐ 1-20
b ☐ 21-50
c ☐ 51-100
d ☐ 101-500
e ☐ 501-1000
f ☐ Over 1000

21. What ONE category BEST describes the business or service done at your facilility?

a ☐ Manufacturing — Aerospace
b ☐ Manufacturing — Electrical/Computer Equipment
c ☐ Manufacturing — Transportation Equipment
d ☐ Manufacturing — Other
e ☐ Scientific Research
f ☐ Financial Services/Insurance/Real Estate
g ☐ Government/Public Administration
h ☐ Construction
i ☐ Public Utilities/Communications
j ☐ Health Service
k ☐ Education/Academic Research
l ☐ Petroleum/Chemical/Mining
m ☐ Wholesale/Retail Trade
n ☐ Sales
o ☐ Consulting (specify field) _____
p ☐ Other (specify) _____

22. What ONE category BEST describes your department?

TECHNICAL

a ☐ Research and Development
b ☐ Production/Manufacturing Engineering
c ☐ Service/Support
d ☐ Quality Control

BUSINESS

e ☐ Administrative
f ☐ Finance/Accounting
g ☐ Marketing/Sales
h ☐ Management Information Systems/ Data Processing
i ☐ Planning

OTHER

j ☐ Education/Training
k ☐ Medical
l ☐ Other (specify)

23. What ONE category BEST describes your job function?

a ☐ Engineer
b ☐ Scientist
c ☐ Programmer/Software Analysis
d ☐ Technician
e ☐ Administrative Assistant/Clerical
f ☐ Analyst (Finance/Market Research/Strategic Planning)
g ☐ Salesperson
h ☐ Upper Manager/President
i ☐ Manager
j ☐ Consultant
k ☐ Educator
l ☐ Other (specify) _____

Comments (e.g., What improvements to the HP PaintJet printer would you like to see?)

_____

_____

_____

CONTEST RULES

No previous or current purchase of HP printers is necessary. To obtain an additional entry card, write to Hewlett-Packard, San Diego Division, 16399 W. Bernardo Drive, San Diego, CA 92127-1899, Attn: Product Marketing. Limit one per person per month.

Entries must be received by the last date of the month to be eligible for that month's drawing. Drawing will be held on the 10th day of the following month, or on the next business day if the 10th falls on a weekend or holiday.

The only information required for entry is name, address, and telephone number. Entrants are not required to fill out the entire card.

Hewlett-Packard employees and their families are not eligible. Void where prohibited or restricted by law (including Algeria, Finland, Italy, and Portugal.) Odds of winning depend upon the total number of entries received each month.

All entries become the property of Hewlett-Packard.

NOTE: Please tape flap before mailing. Thank you very much for your help!

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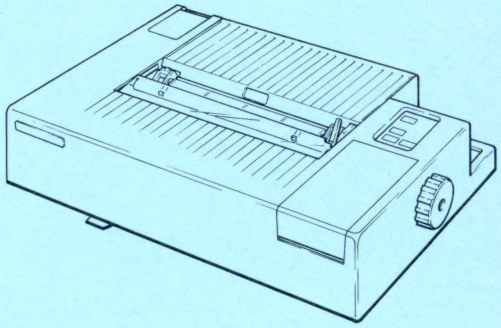
Your Comments Please...

You can help us improve our manuals by sharing your comments and suggestions. Please complete this questionnaire, and return it to us. All comments and suggestions become the property of HP.



Thank you for your help.

please tear off and mail in

HP PaintJet Printer

1. Please describe your primary use of the printer.

☐ printing text ☐ printing graphics ☐ printing on transparency film

2. How would you rate this manual in the following areas?

	very helpful	satisfactory	confusing
explanations	☐	☐	☐
illustrations	☐	☐	☐
organization	☐	☐	☐

Do you have any suggestions for improvement? _____

_____

3. Did you experience any difficulty . . .

☐ connecting your printer and computer? ☐ loading paper?

☐ priming and wiping the print cartridges? ☐ using escape sequences?

How can we clarify these areas? _____

_____

4. Would you like more information on Hewlett-Packard:

☐ inkjet printers ☐ LaserJet printers ☐ impact printers

☐ business plotters ☐ drafting plotters ☐ graphics software

☐ disc drives ☐ tape backup

Name _____

Address _____

Business phone (____) _____ Home phone (____) _____

03630-90001 November 1987

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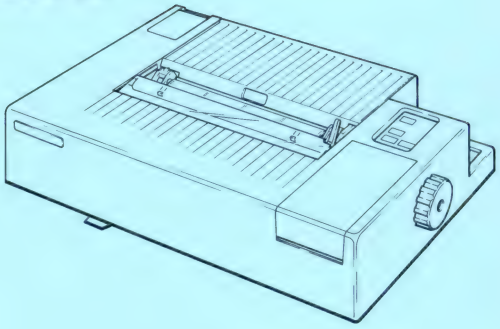

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HP PaintJet
Color Graphics Printer
User's Guide

Manual Part Number: 03630-90001

Printed in U.S.A., NOVEMBER 1987

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16399 W. Bernardo Drive, San Diego, CA 92127-1899

Part No. 03630-90001

Printed in U.S.A.

First edition — April 1987

Second edition — November 1987

Warranty Statement

One-Year Limited Hardware Warranty

Except when used as part of an HP system, Hewlett-Packard warrants your graphics peripheral hardware product against defects in materials and workmanship for a period of one year from receipt by the end user. If HP receives notice of such defects during the warranty period, HP will either, at its option, repair or replace products which prove to be defective.

Should HP be unable to repair or replace the product within a reasonable amount of time, customer's alternative exclusive remedy shall be a refund of the purchase price upon return of the product.

If this product was purchased as part of an HP system in a coordinated shipment or as a system add-on, it is warranted against defects in material and workmanship during the same period as the HP system.

Exclusions

The above warranty shall not apply to defects resulting from: improper or inadequate maintenance by customer; customer-supplied software or interfacing; unauthorized modification or misuse; operation outside of the environmental specifications for the product; or improper site preparation and maintenance.

Obtaining Warranty Service

No warranty registration card is supplied. To obtain warranty service, customer must supply proof of the purchase date. Products must be returned to a service facility designated by HP. HP may repair on-site at the option of the customer. Customer is responsible for travel charges when on-site repair is requested.

Warranty service for products purchased as part of a system will be subject to service in accordance with the system support services.

Customer shall prepay shipping charges for products returned to HP for warranty service and HP shall pay for return of the products to customer. However, customer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

Warranty Limitations

HP makes no other warranty, either expressed or implied, with respect to this product. HP specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. Some states or provinces do not allow limitations on the duration of an implied warranty, so the above limitation or exclusion may not apply to you. However, any implied waranty merchantability or fitness is limited to the one-year duration of this written warranty.

This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state, or province to province.

Exclusive Remedies

The remedies provided herein are customer's sole and exclusive remedies. In no event shall HP be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory. Some states or provinces do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Obtaining Service During or After Warranty

During the Warranty Period

If your hardware should fail during the warranty period, follow the test procedures in the system manuals, then bring the failed piece of equipment to an Authorized HP Personal Computer Dealer Repair Center — or send the equipment to one of the HP Field Repair Centers listed in the directory sent with your product. (HP may repair on-site at your option, in which case you are responsible for travel charges.)

After the Warranty Period

If your hardware should fail after the warranty period, follow the test procedures in the system manuals, then contact an Authorized HP Personal Computer Dealer Repair Center or call your HP Sales and Service Office for details of the services available.

If you are uncertain about which unit to return, call your Authorized HP Personal Computer Dealer or a Field Repair Center for assistance.

When sending equipment to a Field Repair Center, please follow the procedure in *Returning Your Printer for Service,* in this manual.

How to Use This Manual

The first three chapters of the *HP PaintJet User's Guide* contain all the information you should need to connect your printer to a computer and print text and graphics using a software package. The last three chapters contain more detailed programming information for the advanced user. A brief description of the manual's contents follows.

Chapter 1	**Setting Up and Operating the Printer** tells you how to set up your printer, load print cartridges and paper, and use the front-panel buttons.
Chapter 2	**Connecting Your Printer to a Computer** shows you how to set up your printer and computer.
Chapter 3	**Troubleshooting** provides step-by-step instructions on how to correct some of the more common problems that might occur in day-to-day operation.

Chapter 4	**Using Print Features** tells you how to send escape sequences in order to use or change certain print features such as bold, underlining, color text, etc. If you are using a software package, it should not be necessary to read this chapter unless you want to specify setup strings in your software to control printer format. Refer to it if you would like to know how to access these features directly from a computer.
Chapter 5	**Raster Graphics** contains advanced programming information on the printer's graphics capability.
Chapter 6	**Downloadable Characters** contains programming information on how to create a font of user-defined characters.
Appendices A–G	The appendices provide additional reference material on symbol sets, print features, interfacing, printer specifications, and instructions on how to order additional supplies.

Manual Terms and Conventions

We've tried to minimize the use of technical terms in this manual. Computer terms are defined in the glossary. Refer to the glossary whenever you are unfamiliar with a word.

Explanations of a special type style and some abbreviations follow.

BOLDFACE TYPE	Denotes buttons or switches located on the printer and computer, such as **ON/OFF**. Also denotes an ASCII control character, such as **ESC**, or an escape sequence, such as **ESC(s0B**.
cpi	Characters per inch, or pitch. Describes the number of characters that will print within one horizontal inch. For example, PaintJet can print at 10, 12, and 18 cpi.
dpi	Dots per inch, the resolution of raster images on the printer. PaintJet prints raster images at either 90 (default) dpi or 180 dpi.
lpi	Lines per inch. PaintJet can print at 6, 8, or 9 lpi.

NOTE: Be sure not to confuse the letter **O** with the number **0**, or the lowercase letter **l** with the number **1**. ■

A Note on Using Software

Software packages usually support, or "drive", a number of different peripheral devices. A printer driver is that part of the software written specifically to drive a particular printer. For best results, use your HP PaintJet with a software package that has an "HP PaintJet" or "HP 3630" printer driver.

If an HP PaintJet (or HP 3630) driver is not listed for your software, check with your software dealer of manufacterer to see if an HP PaintJet driver is or will be available. For specific directions on installing a driver, *refer to your software documentation.* You may need to key in answers to certain questions asked by the software, such as what type of printer you are using or which port on your computer is connected to the printer. Chapter 4 explains how to specify setup strings that might be required for your software.

If your printer has an HP-IB interface, *be sure the address switch settings match the one used by the software package.* This is usually address 01, the address setting of the printer when shipped. You will also need to direct printer output over the interface to the computer's HP-IB port and address. This may be done through the software, or else through the computer's operating system.

If your printer has an RS-232-C serial interface, *be sure the handshake, baud rate and parity switch settings comply with the software's recommendations.* If the software documentation does not specify these settings, try using the setting recommended for your computer in Chapter 2, or the fastest (highest) baud rate that will work with your computer and printer. (Refer to Appendix D.) You will also need to direct printer output over the interface to the computer's RS-232-C port. This may be done through the software, or else through the computer's operating system.

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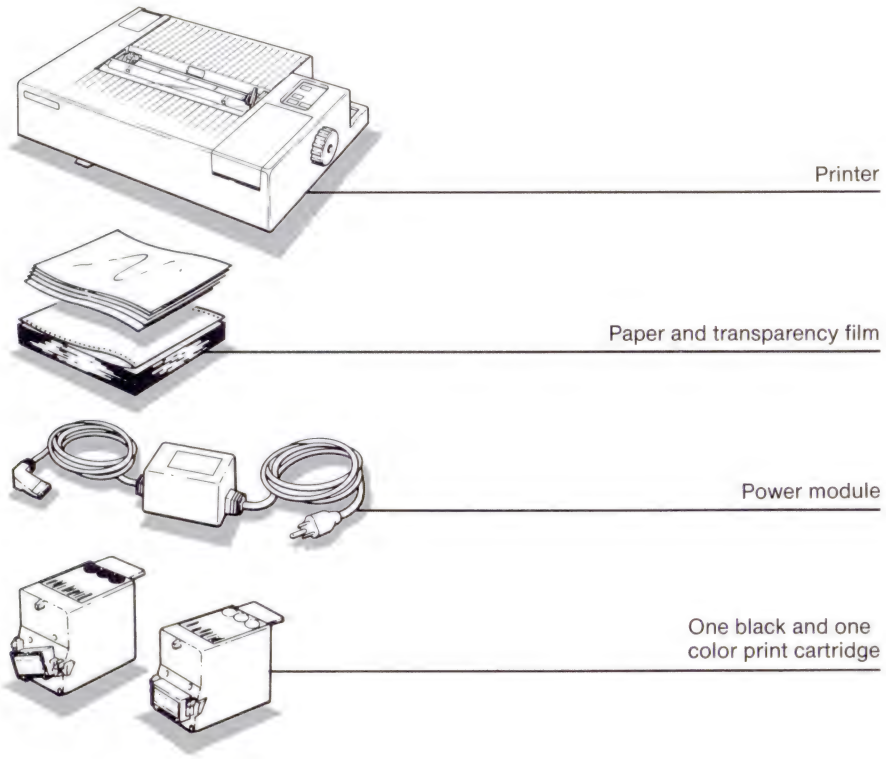
1

Setting Up and Operating the Printer

This chapter shows you how to set up your printer, load paper and print cartridges, operate the buttons, and run the built-in self test.

Initial Inspection

Carefully unpack and inspect the printer and accompanying parts. Compare your parts with those shown below.

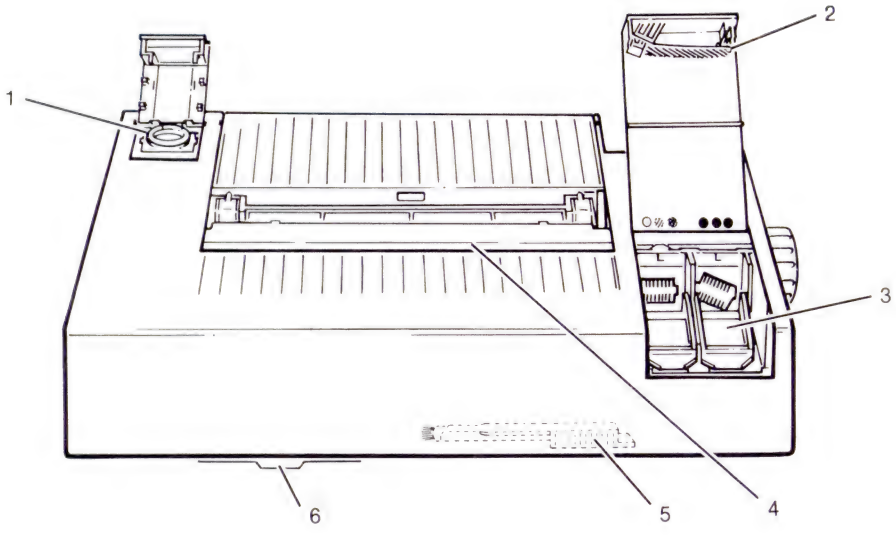


Your printer was inspected before the unit was shipped from Hewlett-Packard. If any parts are missing, contact the dealer or HP Sales and Support Office where you purchased the printer. Save the carton and packing materials in case you ever need to ship your printer. If you received your printer in damaged condition, notify the dealer or HP Sales and Support Office where you purchased the printer, and file a claim with the carrier.

For information on ordering additional supplies, refer to Appendix G.

NOTE: An interface cable (required to connect the printer to a computer) is *not* included with your printer and must be purchased separately. Refer to Chapter 2 or consult your dealer to determine which interface cable is required for your computer. ■

Printer Features



1. **Primer** — Restores full ink flow in the print cartridges by removing air bubbles.

2. **Wiper** — Removes ink and paper dust from the nozzle plate on a print cartridge. Should *always* be used before loading cartridges. (Do *not* use tissue).

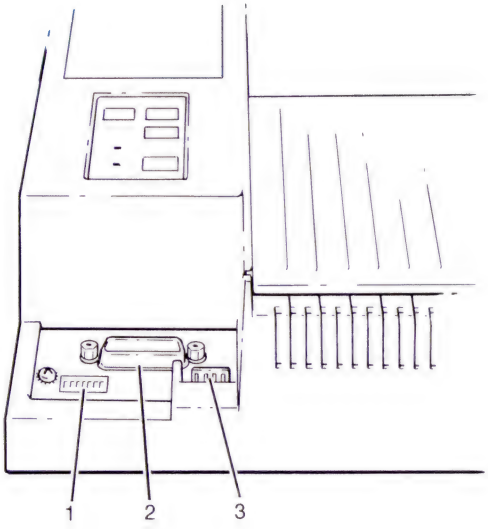
3. **Carriage** — Contains print cartridges that propel ink onto the paper as the carriage scans across the paper.

4. **Paper Bail** — Holds paper in place on the roller. The rear edge of the paper bail functions as a tear bar for Z-fold paper.

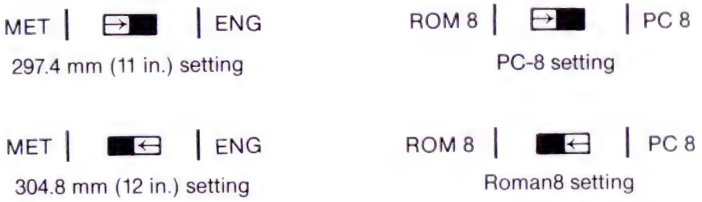
5. **Brush** — Removes dried ink from the metal connectors in the rear of the carriage.

6. **Help Card** — Provides abbreviated instructions for priming and wiping the print cartridges.

The Rear Panel



1. **Rear-panel Switches** — Used to select English or metric paper, and the Roman8 or PC-8 symbol set.



   In addition, HP-IB and RS-232-C printers have switches used to set up the interface between the printer and the computer. Refer to Chapter 2 and the Appendix D (RS-232-C) or Appendix E (HP-IB) for more information on switch settings and interfacing.

2. **Interface Connector** — Accepts the interface cable used to connect the printer to a computer. Refer to Chapter 2.

3. **Power Socket** — Accepts the power cord connector from the power module.

Getting Started

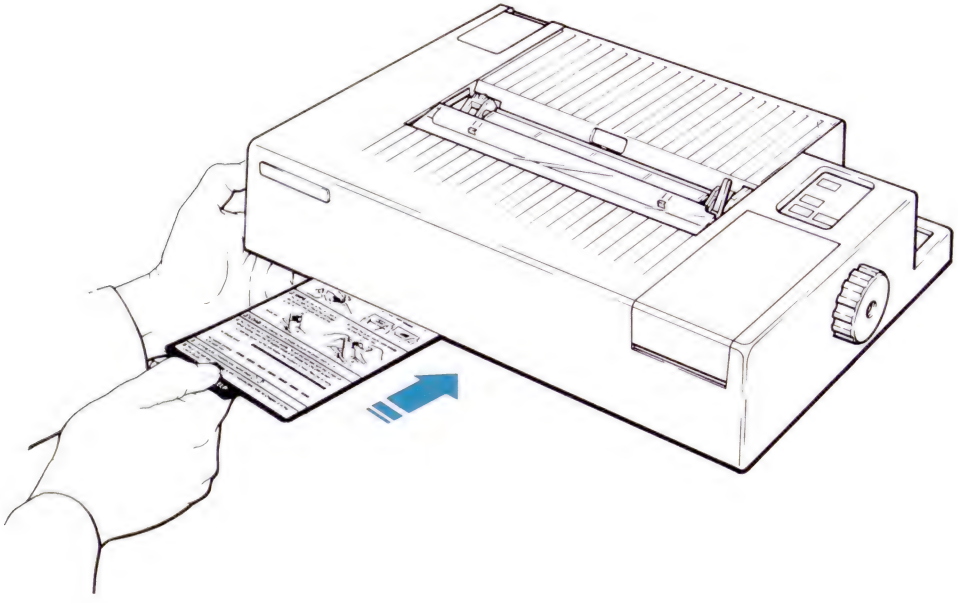
Setting up your printer is simple. Follow the instructions in this chapter for the steps listed below.

1. Install the help card (if it is not already installed).
2. Connect the power module.
3. Prime, wipe, and load the print cartridges.
4. Load paper.
5. Run the self test.

Installing the Help Card

The help card contains abbreviated instructions for priming and wiping the print cartridges. Complete instructions are contained in this manual.

If the help card is not already installed, insert it into the tray beneath the printer. The tabs at the top end of the card will lock the card in place.



Connecting the Power Module

The power plug and power module are configured for the power specifications of the country to which it was shipped. Check the voltage tag on your power module to be certain that the listed input voltage matches your power source. Also be sure that the name on the module, Power Module 1, matches the name above the printer's power socket.

If your power module has the wrong voltage or wall power plug for your requirements, refer to Appendix F for a list of available power module options. *Damage to the printer may occur if you use a module with incorrect voltage.* Contact your authorized dealer or local HP Sales and Support Office for information on obtaining the correct module.

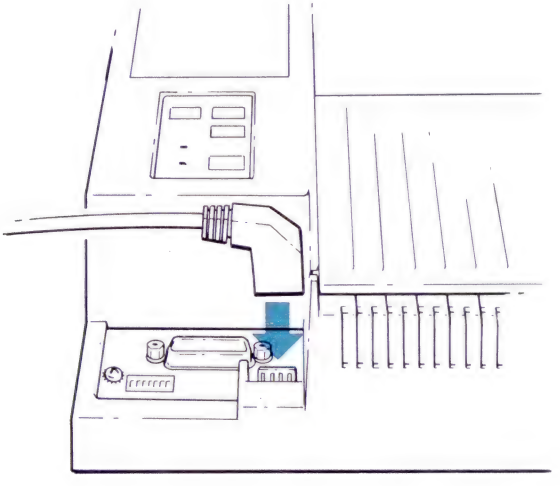
Connect the power supply as shown in the following figure.

WARNING

Be sure to use the power module with a properly grounded outlet to avoid electrical shock.

---

1. Insert the small connector into the power socket on the back of the printer. Press down on the connector until it fits into place.

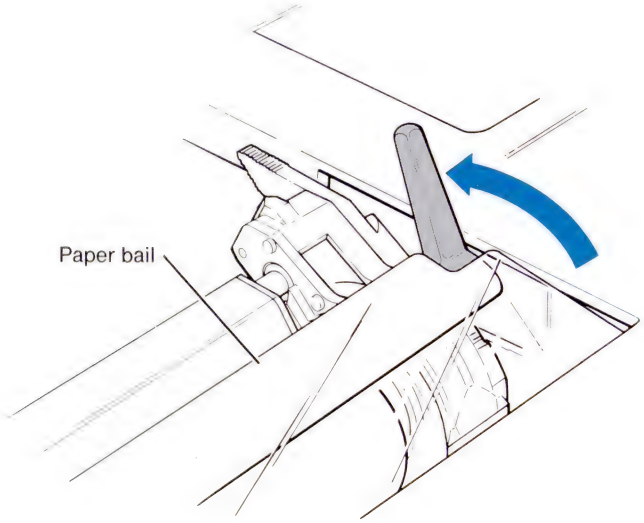


2. Insert the plug on the power module's cord into a grounded outlet.

   NOTE: Should the power module interfere with your computer's video monitor, move the module away from the monitor. ■

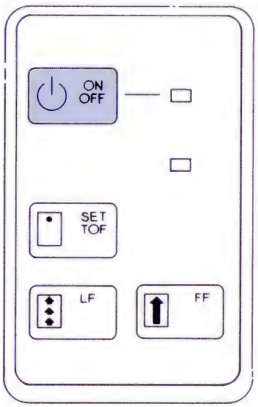
Turning On the Printer

Before turning on the printer, *be sure the paper bail is against the roller.* Otherwise, the printer will not initialize properly.



To turn on the printer, simply press the **ON/OFF** button as shown in the following figure. When the printer is on, the green power light directly beside the **ON/OFF** button will be on. The carriage will move slightly as the printer initializes. In addition, certain default conditions are established (see page 1-44).

Press the **ON/OFF** button a second time to turn the printer off.



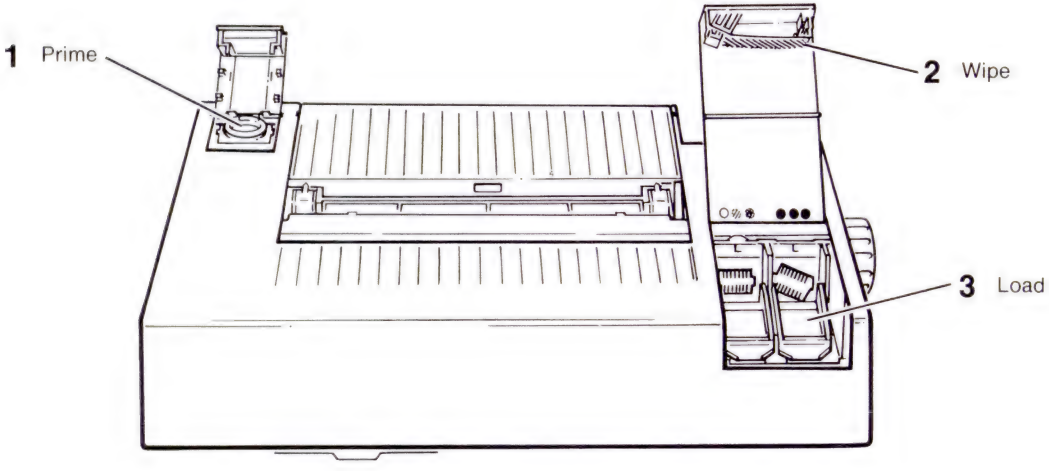
WARNING

The **ON/OFF** button *turns off the printer only*, not the power module. Voltage is present at the printer's rear-panel connector while the module is plugged in.

Installing the Print Cartridges

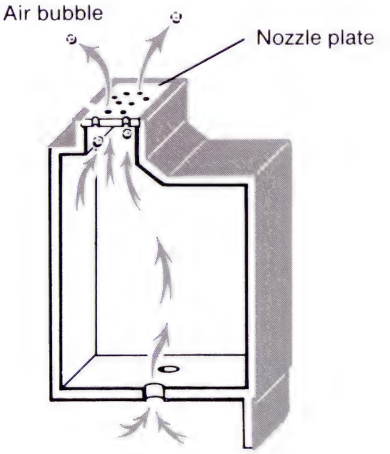
Your printer operates with two print cartridges — one with color ink and one with black ink. When used with PaintJet paper, the ink supply in a black print cartridge will last for about 1100 text pages (based on 1000 characters per page). A greater per-page ink density is required for graphics. Therefore, the ink supply in a color cartridge will last for about 180 pages of color graphics on paper, or slightly fewer on transparency film. The lifetime of a cartridge will vary according to your application.

Always prime and wipe a new cartridge before loading it into the printer. The following illustration shows the parts of the printer used in priming, wiping, and loading a print cartridge.

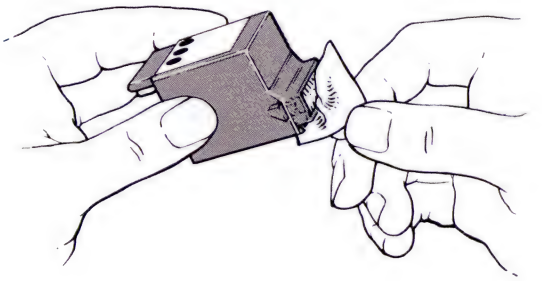


1. Priming the Cartridges

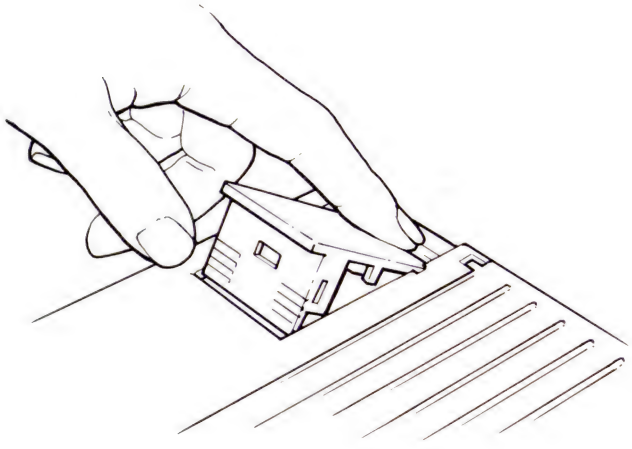
Priming forces ink through the nozzle plate and removes air bubbles.



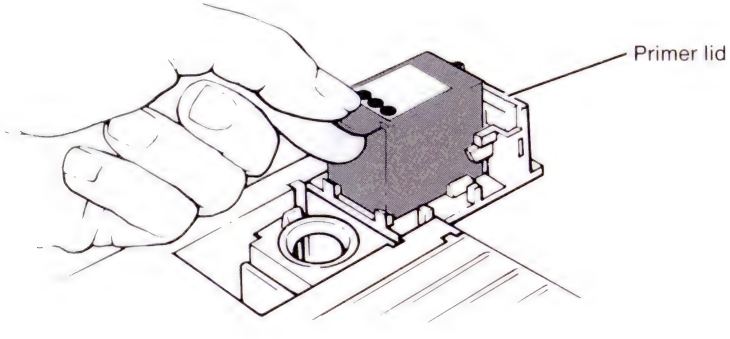
a. Remove and discard the protective tape.



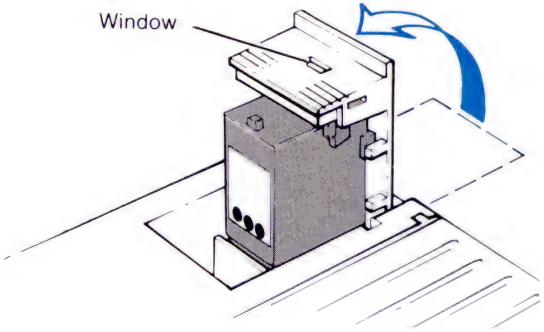
b. Open the lid of the primer on the left rear corner of the printer.



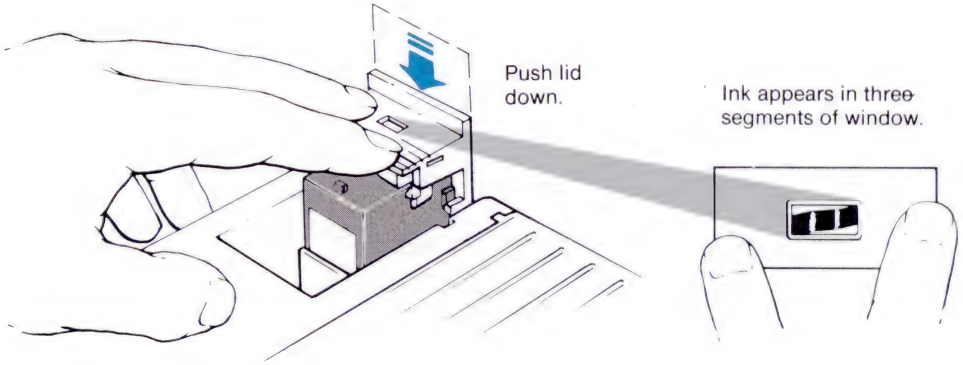
c. Insert the print cartridge into the primer's *lid*. The cartridge should fit snugly into place and lie flat.



d. Raise the lid up to an upright position. On top of the lid you will see a plastic window with three segments.



e. Press the lid straight down until it stops (a distance of about one inch). Hold it down until ink appears in the window (no more than 3 seconds!), then release.

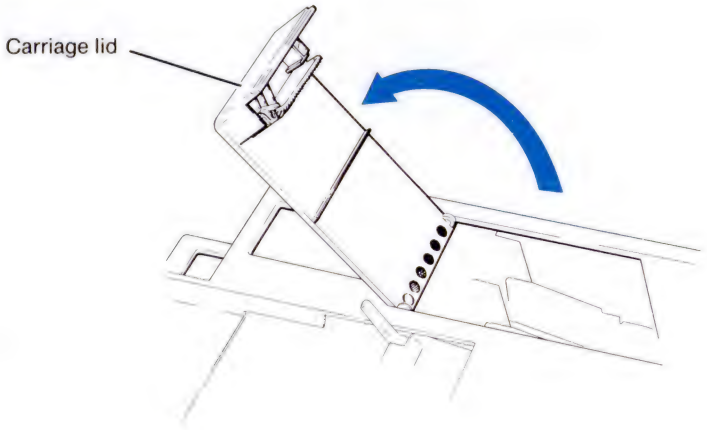


f. Remove the cartridge from the primer and close the lid.

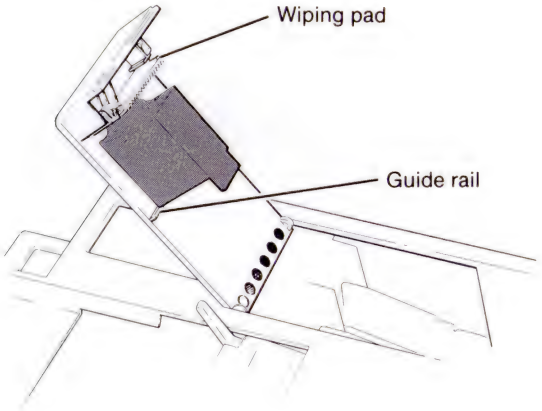
2. Wiping the Cartridges

NOTE: Do *not* wipe a cartridge with tissues, paper towels, or any fibrous materials, since the fibers can clog the nozzles. ■

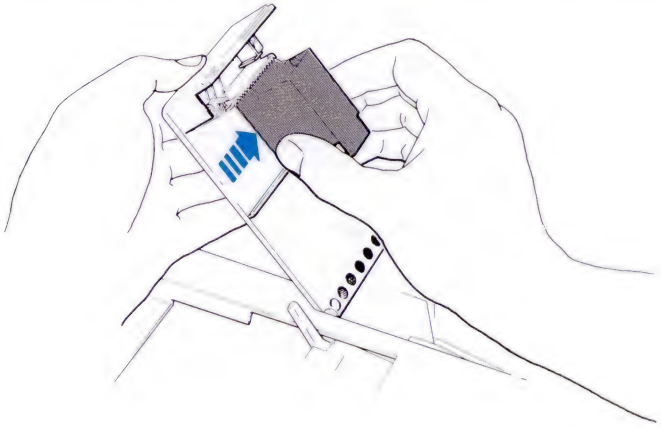
a. Lift the carriage lid on the front right corner of the printer.



b. Place the cartridge flat between the wiping pad and guide rail. The bottom of the cartridge **must lie flat against the lid**.



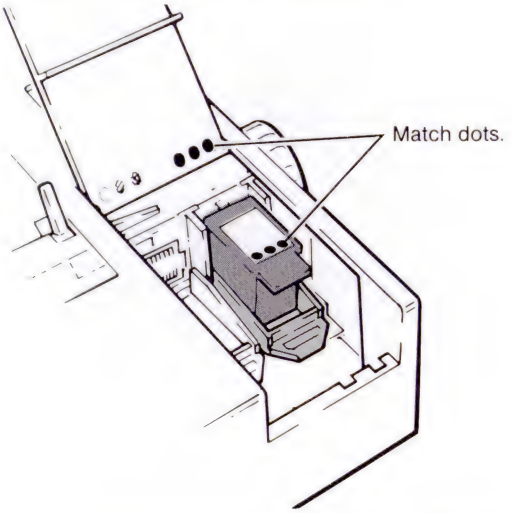
c. With a **brisk** left-to-right stroke, slide the nozzle plate across the pad. The nozzle plate should now appear clean; if not, wipe again.



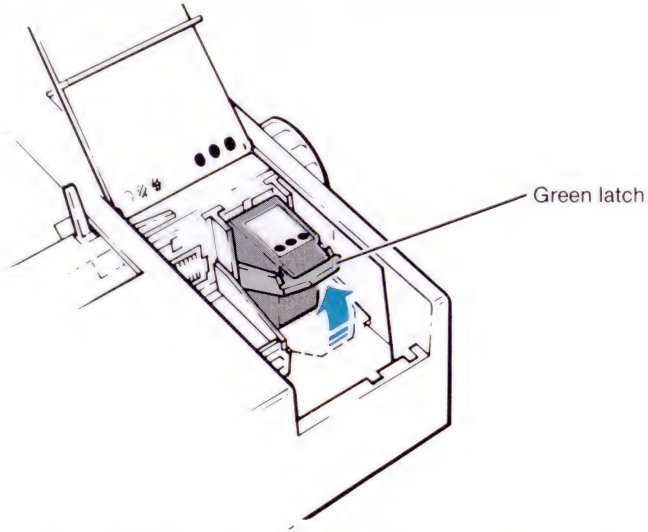
3. Loading the Cartridges

a. Match the dots on the cartridge to the corresponding dots on the bottom of the carriage lid. The dots are the key to the correct side in which to load the cartridge. Refer to the figure at the top of the next page.

b. Place the cartridge so that it lies flat—as far forward in the carriage as possible. (The cartridge will fit loosely.)



c. Raise the green latch until it snaps into place and secures the cartridge.



d. If you have a new printer and are loading a pair of cartridges for the first time, repeat the priming, wiping, and loading procedures with the other cartridge.

Types of Paper

Your printer accepts a wide variety of printing papers that, due to a difference in their ink-absorption capabilities, differ in the print quality they offer. Papers also vary in their paper-dust characteristics, a factor which can contribute to occasional clogging of the inkjet nozzles. Nozzle clogs may increase with use of some papers. This problem is easily solved by priming and wiping — the same procedure performed when installing the print cartridges. (The procedure is also described on the printer's help card and in Chapter 3 of this manual.)

The use of PaintJet paper will provide the most trouble-free operation and the highest print quality available from your printer. PaintJet paper has been specially coated to minimize paper dust and to maximize ink contrast and color brilliance. See Appendix G for ordering information.

CAUTION

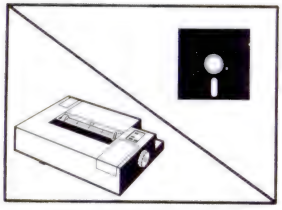
Use of address labels is *not* recommended. Labels are likely to become jammed and may cause damage to the printer.

Using Transparency Film

Use *only* HP PaintJet film. Other transparency films do not have compatible ink-absorbing capabilities to give satisfactory results. Similarly, the provided plastic sleeves are specifically designed to protect transparencies and control color development. *The use of other sleeves is not recommended.*

You can use HP PaintJet film within minutes after printing. But for maximum color intensity, allow the film to develop in the sleeve for 1–2 hours.

In order to obtain the color intensity necessary for satisfactory overhead transparencies, **be sure the printer is in transparency mode**.



There are three possible ways to activate transparency mode.

- Select transparency mode through your software menu (if available on your software package).

or

- Use the front-panel buttons. Turn the printer off. *Hold down* the **SET TOF** button while pressing and releasing the **ON/OFF** button. Be sure to release the **ON/OFF** button first; then release the **SET TOF** button. (When the printer is in transparency mode, it will make multiple sweeps over each line and will print in the left-to-right direction only.)

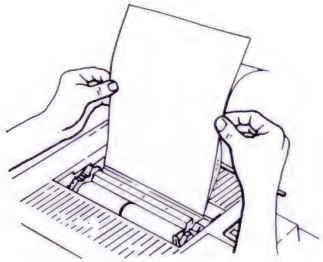
or

- Send the escape sequence **ESC & k 3 W** (refer to *Print Modes* in Chapter 4).

When you are certain that the printer is set for transparency mode, perform the following steps to load the film.

1. To avoid fingerprints, handle the film by the edges.

   Raise the printer's green lever and move the printer's right sprocket to the right. Load the film with the sealed end down and the backing sheet facing you.

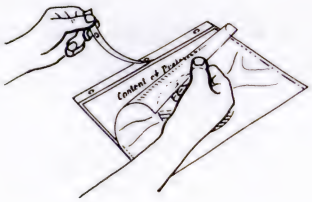


   If necessary, refer to the detailed instructions for loading cut sheet media on page 1-30.

2. After printing, allow the film to dry for five minutes. (IN HUMID ENVIRONMENTS, let film dry for 30 minutes.) Then slowly peel off the film's backing sheet.

3. Insert the printed film into a provided plastic sleeve.

   Peel off the sleeve's adhesive strip backing and seal. Your transparency can now be projected.



Remember, the film will achieve maximum color intensity if you allow it to develop in the sleeve for 1–2 hours.

Selecting Paper Size

The printer is designed to use both metric and English paper or transparency film.

With the printer turned *off*, set the **MET/ENG** switch on the printer's rear panel for the paper size you are using.

297.4 mm (11 in.) setting

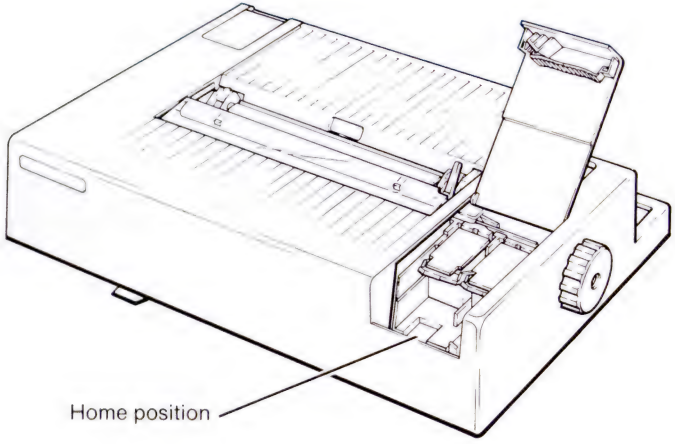
304.8 mm (12 in.) setting

NOTE: The printer only "reads" the settings of the rear-panel switches when you turn it on. If you change any switch settings while the printer is on but do not turn the printer off and then on again, the new settings will be ignored by the printer. ■

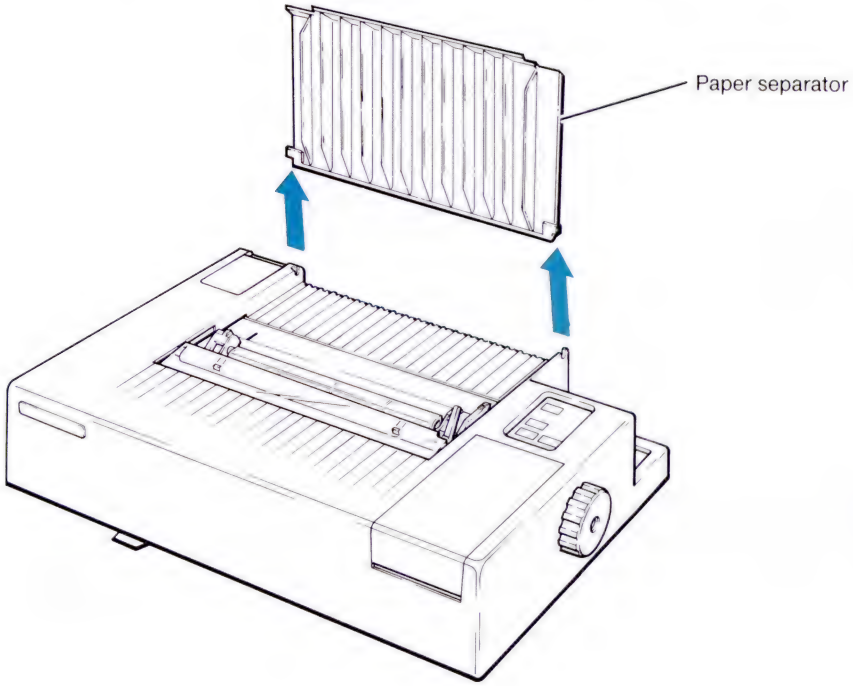
Loading Z-Fold Paper

CAUTION

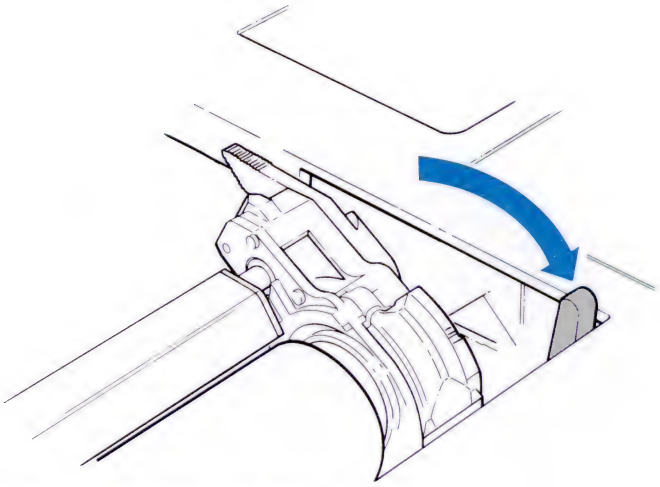
Be sure the carriage is in the home position. Otherwise, paper can snag on the rear of the carriage, causing damage to the printer. If the carriage is not in home position, turn the printer ON and then OFF.



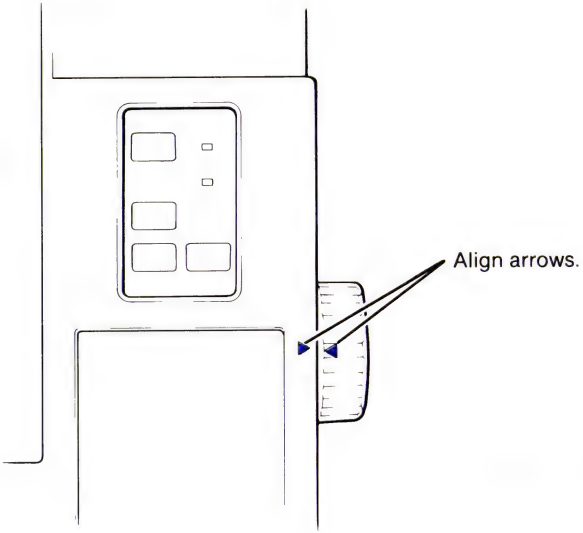
1. Remove the paper separator.



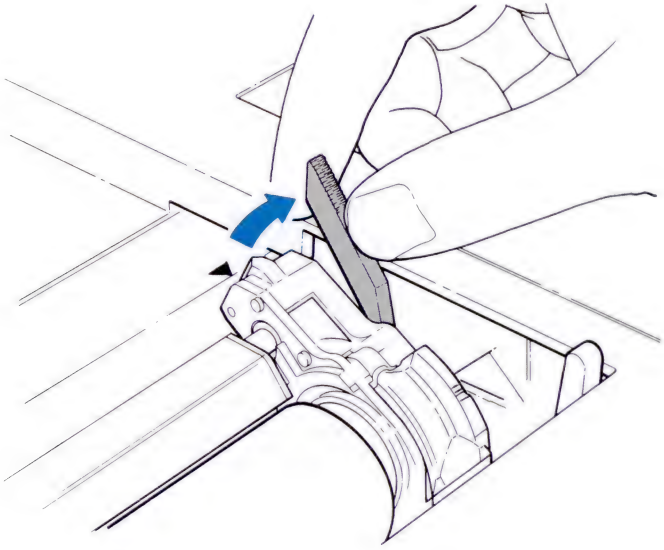
2. Pull the paper bail lever away from the roller.



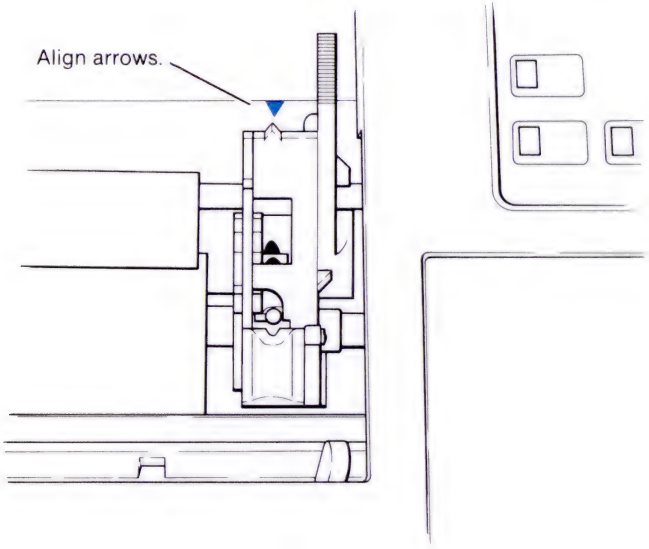
3. To facilitate paper loading, turn the paper-advance knob until an arrow on the knob is directly opposite the arrow on the printer's right edge.



4. Lift the green lever on the right sprocket so that the sprocket is adjustable.

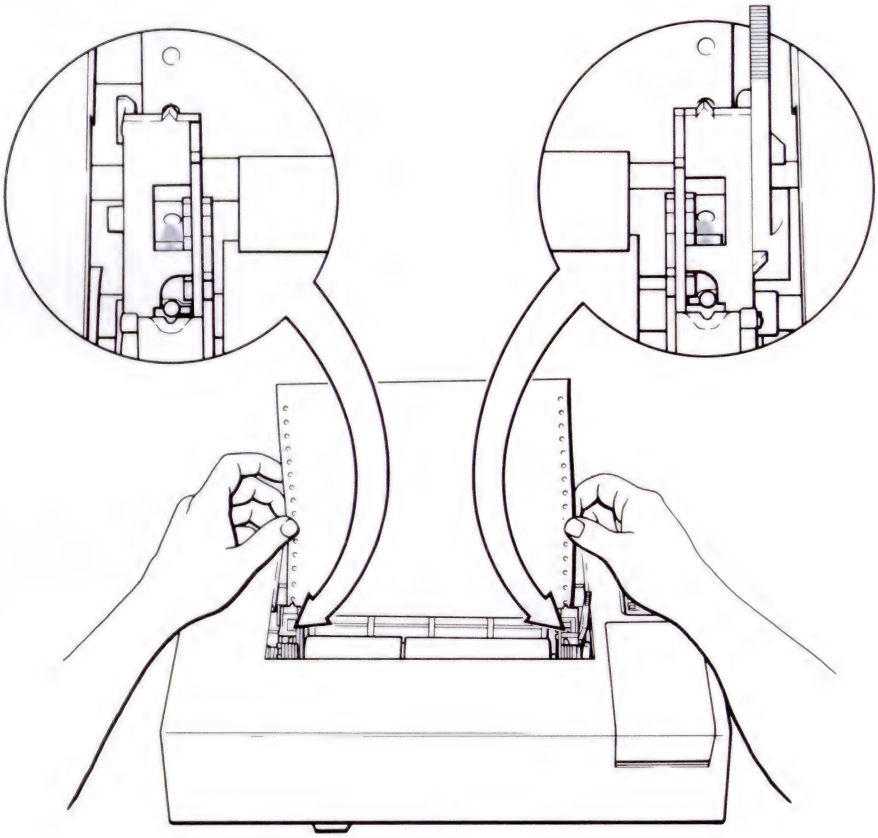


5. Align the arrow on the right sprocket with the guide arrow. Leave the green lever up until after you have loaded the paper.

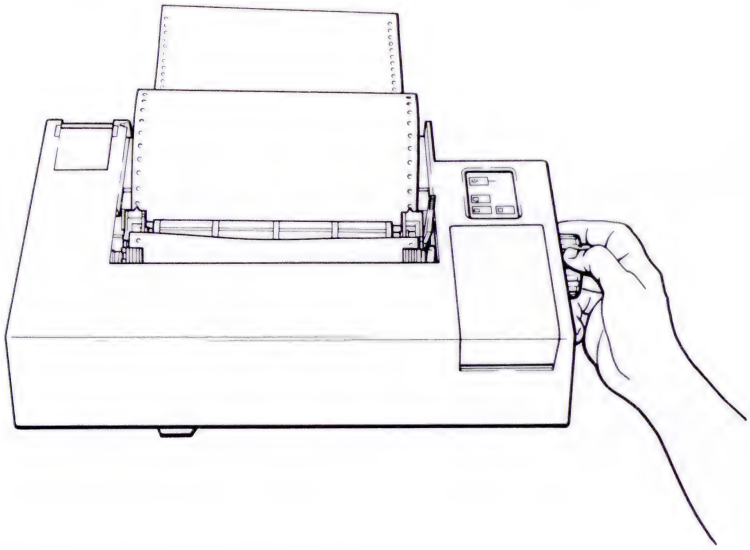


6. Insert the paper behind the sprockets. (If you are using PaintJet paper, load the paper so that words "PRINT THIS SIDE" will be visible when the paper passes out over the roller.)

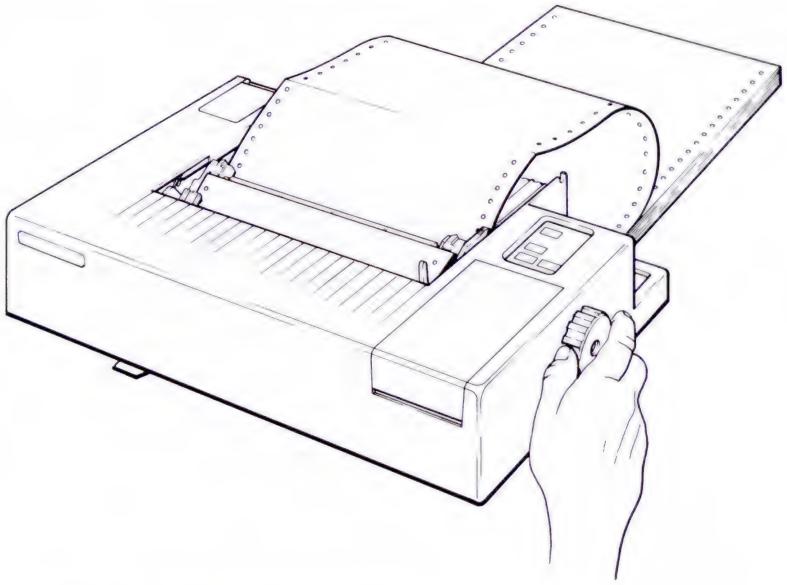
   Be sure the green sprocket pins align directly with the holes in the paper. Readjust the right sprocket as necessary.



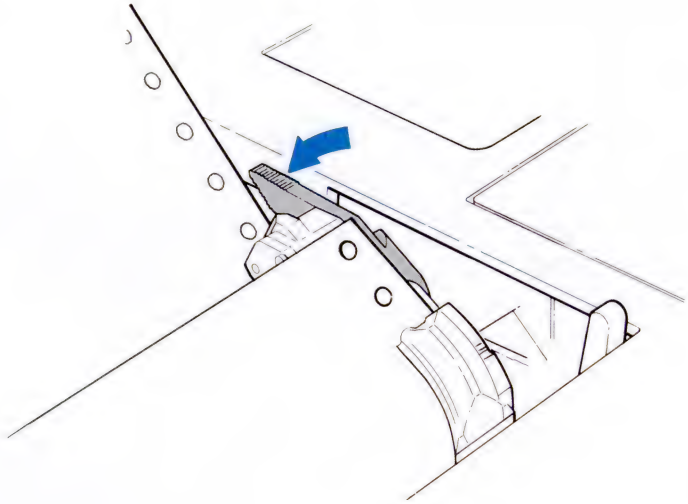
7. *Slowly* turn the knob to advance the paper. (If the paper is crooked, back the paper out of the printer and begin again.)



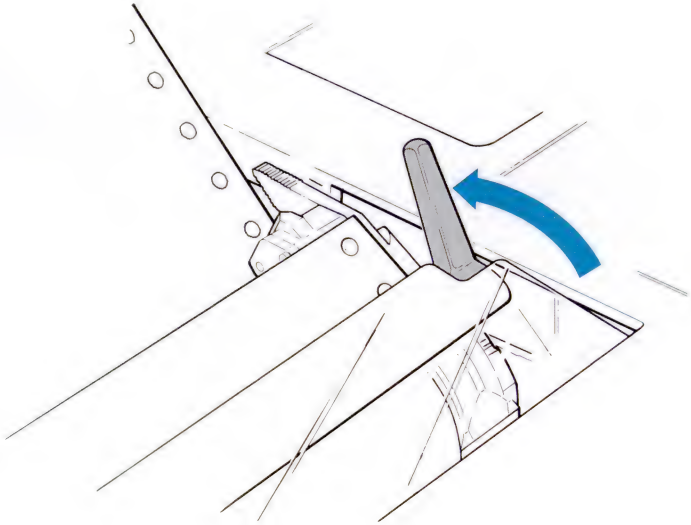
8. Continue feeding the paper until it covers the roller.



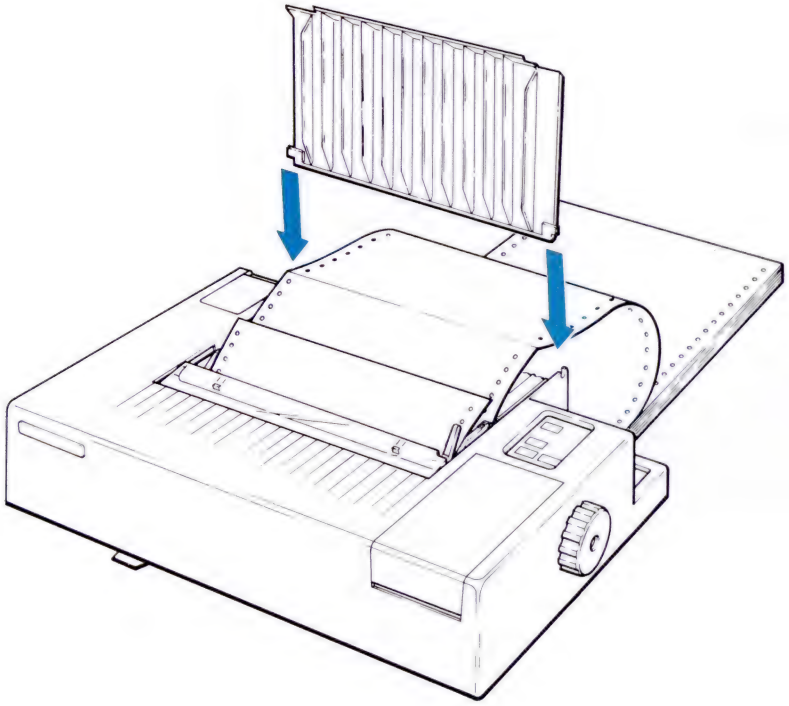
9. Lower the green lever to lock the right sprocket in place.

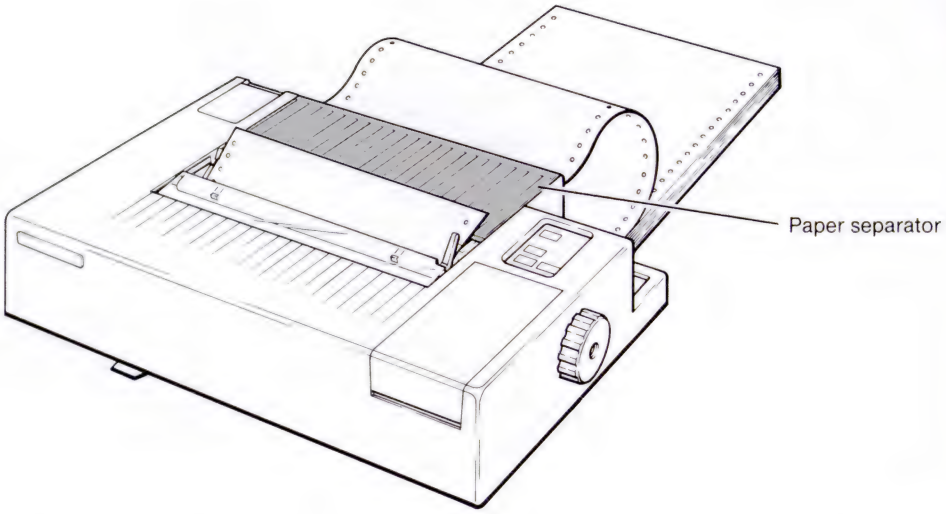


10. Push the paper bail back against the paper.



11. Replace the paper separator. Make sure that the paper exiting the printer passes *over the top* of the paper separator. The paper entering the printer should pass *under* the paper separator. Refer to the following *two* figures.





NOTE: The rear edge of the paper bail functions as a tear bar. With the paper bail against the paper, line up the perforation just above the tear bar and pull the paper toward you. ■

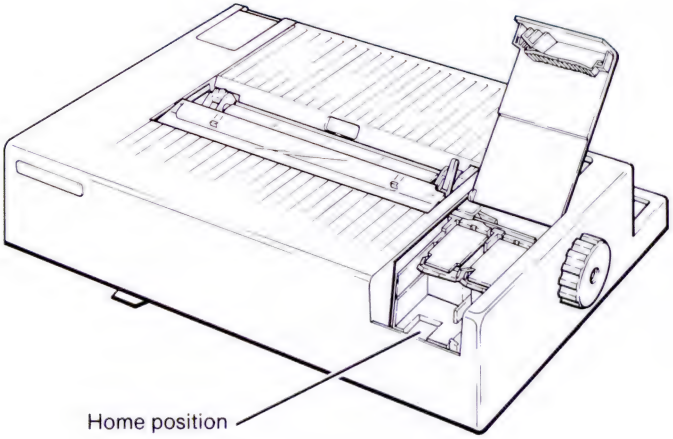
You are now ready to run the printer's self test. (See page 1-36.)

You can set top of form by turning the printer ON, or (if the printer is already ON) pressing the **SET TOF** button. You will hear a "click" sound. For more information on setting top of form, see page 1-39.

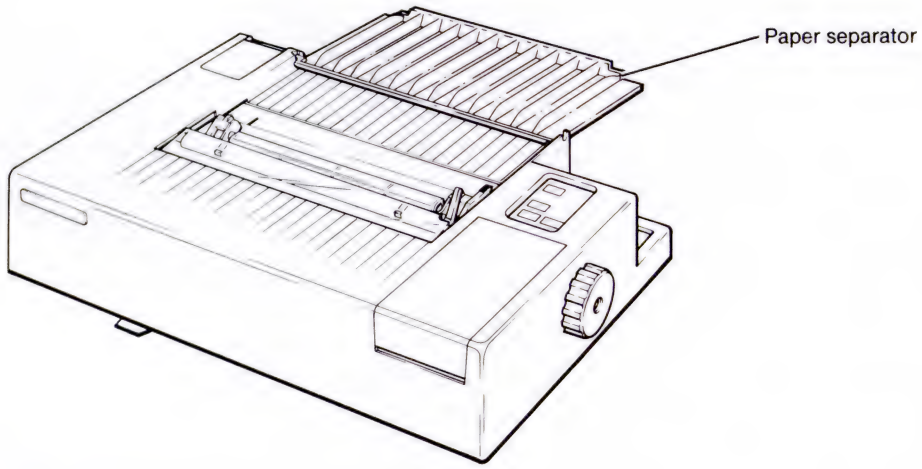
Loading Cut Sheet Media

CAUTION

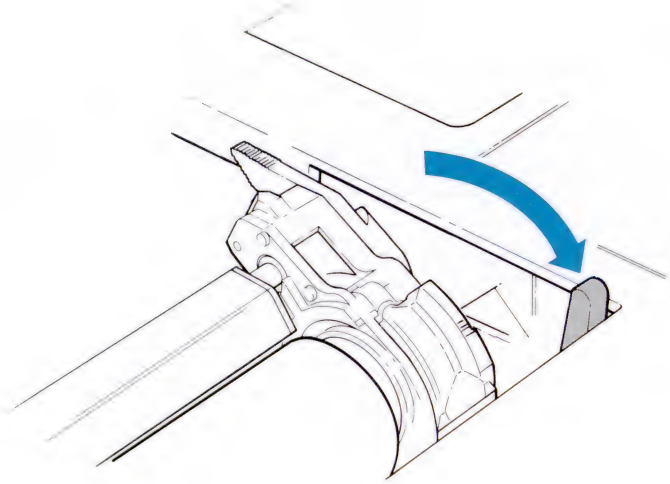
Be sure the carriage is in the home position. Otherwise, the paper can snag on the rear of the carriage, causing damage to the printer. If the carriage is not in the home position, turn the printer ON and then OFF.



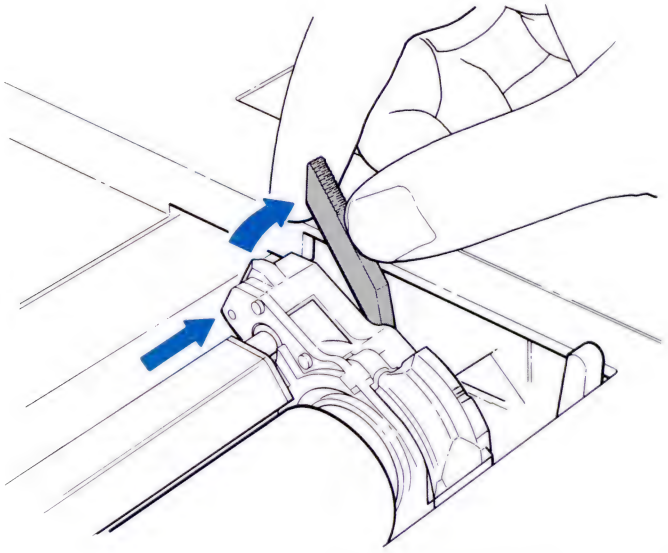
1. Flip back the paper separator.



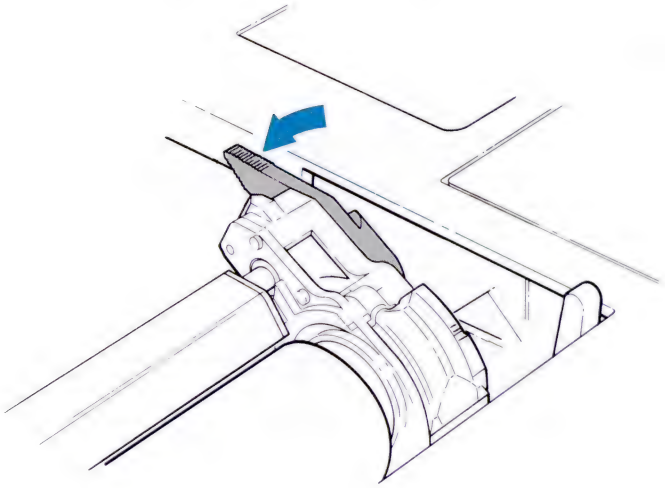
2. Pull the paper bail lever away from the roller.



3. Lift the green lever and move the sprocket to the far-right position.

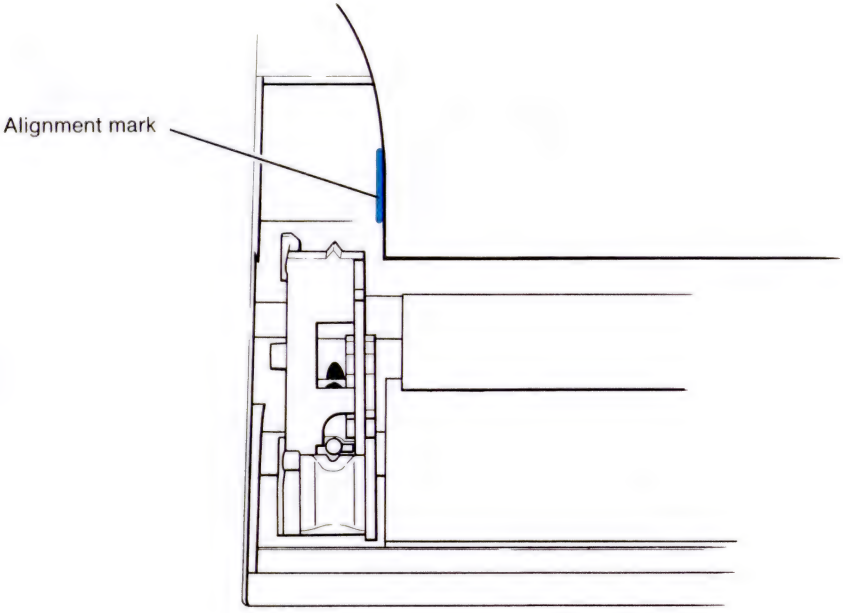


4. Lower the green lever to lock the sprocket in place.

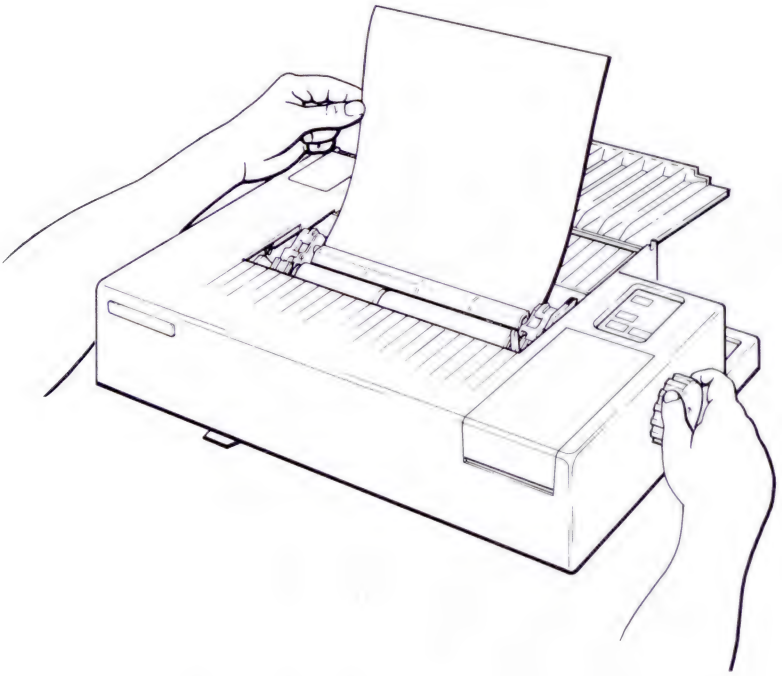


5. Align the left side of the paper with the mark on the printer.

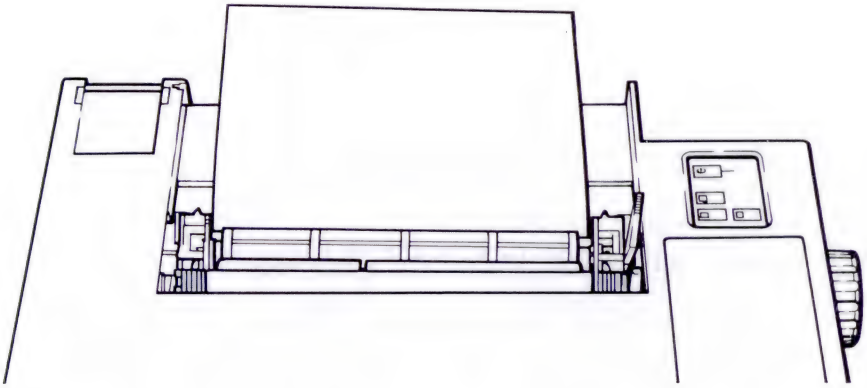
NOTE: Only one side of PaintJet paper is coated for printing. Be sure to load PaintJet paper so that printing occurs on the side of the paper that is face up in the box. ■



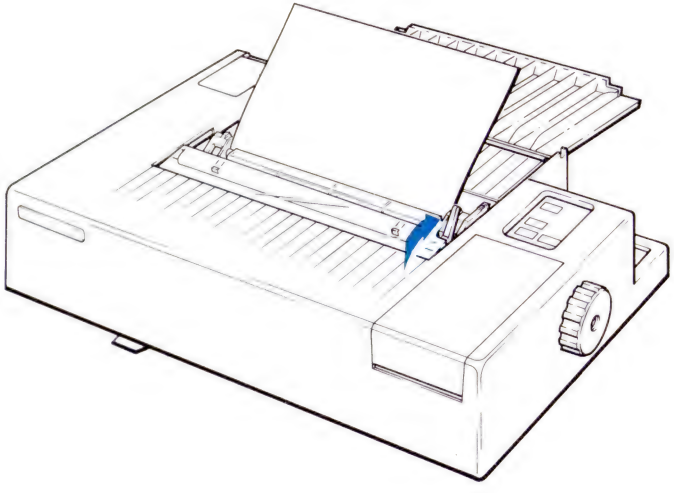
6. Turn the knob to feed the paper, just as if you were loading a typewriter.



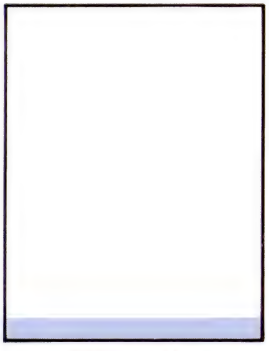
7. Advance the paper to the top of the plastic sprocket shields. This will prevent the paper from jamming under the paper bail.



8. Push the paper bail back against the paper.



NOTE: Do *not* attempt to reverse feed the paper within one inch of the paper's bottom edge. A reverse feed could cause the paper to slip, which in turn could affect print quality. ■



You are now ready to run the self test. (See page 1-36.)

You can set top of form by turning the printer ON, or (if the printer is already ON) pressing the **SET TOF** button. For more information on setting top of form, see page 1-39.

Self Test

Use the printer's built-in self test to verify that the printer is operating properly. The printer does not have to be connected to a computer.

NOTE: The self test should not be used with transparency film. The printer will not be in transparency mode and output will be of low quality. ■

Follow these steps to run the self test.

1. Load paper.
2. Be sure the printer is OFF.
3. While *holding down* the **FF** button, press and release the **ON/OFF** button. The self test will begin. (Be sure to release the **ON/OFF** button first; then release the **FF** button.)
4. You can stop the self test at any time by pressing the **ON/OFF** button again.

The self test will print characters from either the Roman8 or PC-8 symbol set, depending on the setting of the **ROM 8/PC 8** switch.

Nozzle Test

Examine your self test and compare it to the appropriate self test reproduced on the next page.

When all 30 inkjet nozzles in the black print cartridge are working correctly, the black print cartridge will produce 30 lines — three rows of 10 lines each.

Similarly, the color print cartridge will produce three rows of 10 lines each — one row for cyan, one row for yellow, and one row for magenta.

Roman8 Self Test

```
                    RAM/ROM OK       XXXXX10       6BEBBA

!"#$%&'()*+,-./@ABCDEFGHIJKLMNOPQRSTUVWXYZ¯ÔùáföÁÃãÐðÍÌÓÒÕõŠšÚŸýÞþ·µ¾¶-¼½ªº«■»'a
"#$%&'()*+,-./@ABCDEFGHIJKLMNOPQRSTUVWXYZ¯ÔùáföÁÃãÐðÍÌÓÒÕõŠšÚŸýÞþ·µ¾¶-¼½ªº«■»'ab
#$%&'()*+,-./@ABCDEFGHIJKLMNOPQRSTUVWXYZ¯ÔùáföÁÃãÐðÍÌÓÒÕõŠšÚŸýÞþ·µ¾¶-¼½ªº«■»'abc
$%&'()*+,-./@ABCDEFGHIJKLMNOPQRSTUVWXYZ¯ÔùáföÁÃãÐðÍÌÓÒÕõŠšÚŸýÞþ·µ¾¶-¼½ªº«■»'abcd
%&'()*+,-./@ABCDEFGHIJKLMNOPQRSTUVWXYZ¯ÔùáföÁÃãÐðÍÌÓÒÕõŠšÚŸýÞþ·µ¾¶-¼½ªº«■»'abcde
&'()*+,-./@ABCDEFGHIJKLMNOPQRSTUVWXYZ¯ÔùáföÁÃãÐðÍÌÓÒÕõŠšÚŸýÞþ·µ¾¶-¼½ªº«■»'abcdef
```

PC-8 Self Test

```
                    RAM/ROM OK       XXXXX00       6BEBBA

!"#$%&'()*+,-./@ABCDEFGHIJKLMNOPQRSTUVWXYZ▒▒▀╖┘╢αβΓπΣσμτΦΘΩδ∞φϵ∩≡±≥≤⌡⌠÷≈°··√η²'a
"#$%&'()*+,-./@ABCDEFGHIJKLMNOPQRSTUVWXYZ▒▒▀╖┘╢αβΓπΣσμτΦΘΩδ∞φϵ∩≡±≥≤⌡⌠÷≈°··√η²'ab
#$%&'()*+,-./@ABCDEFGHIJKLMNOPQRSTUVWXYZ▒▒▀╖┘╢αβΓπΣσμτΦΘΩδ∞φϵ∩≡±≥≤⌡⌠÷≈°··√η²'abc
$%&'()*+,-./@ABCDEFGHIJKLMNOPQRSTUVWXYZ▒▒▀╖┘╢αβΓπΣσμτΦΘΩδ∞φϵ∩≡±≥≤⌡⌠÷≈°··√η²'abcd
%&'()*+,-./@ABCDEFGHIJKLMNOPQRSTUVWXYZ▒▒▀╖┘╢αβΓπΣσμτΦΘΩδ∞φϵ∩≡±≥≤⌡⌠÷≈°··√η²'abcde
&'()*+,-./@ABCDEFGHIJKLMNOPQRSTUVWXYZ▒▒▀╖┘╢αβΓπΣσμτΦΘΩδ∞φϵ∩≡±≥≤⌡⌠÷≈°··√η²'abcdef
```

This shows that the 10 cyan nozzles, the 10 yellow nozzles and the 10 magenta nozzles are working correctly. The 10 yellow lines will be faint.

All 30 black nozzles and all 30 color nozzles should be printing lines on the self test. If any of the nozzles are not printing, check the following troubleshooting list.

- Be sure the green latches that secure the cartridges are in the UP position.
- Repeat the prime and wipe procedures that you performed before loading the print cartridges.
- Run the self test again. If output is still unsatisfactory, see pages 3-4–3-11 in Chapter 3.

RAM/ROM Test

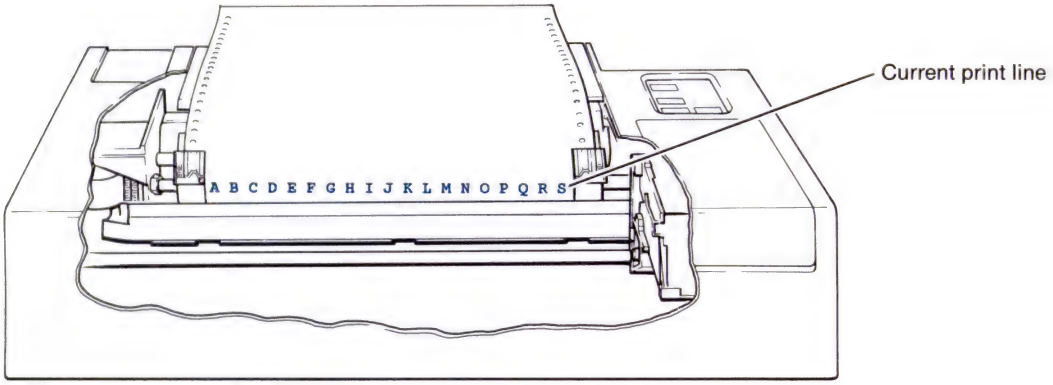
The sequence that follows RAM/ROM OK (for example, XXXXX10) indicates the rear-panel switch settings when the printer was turned on.

1 = switch set to 1 position
0 = switch set to 0 position
X = switch not used

The number sequence on the far right (for example, 706CE7) is used by service personnel.

Setting Top of Form

Printing occurs on the line directly opposite the nozzle plates on the print cartridges. Keep this in mind when you are setting top of form, which is the line where printing can begin on a page.



You can set top of form in two ways.

- Turn on the printer with paper loaded. Top of form is set automatically to the current print line as shown in the previous figure.

or

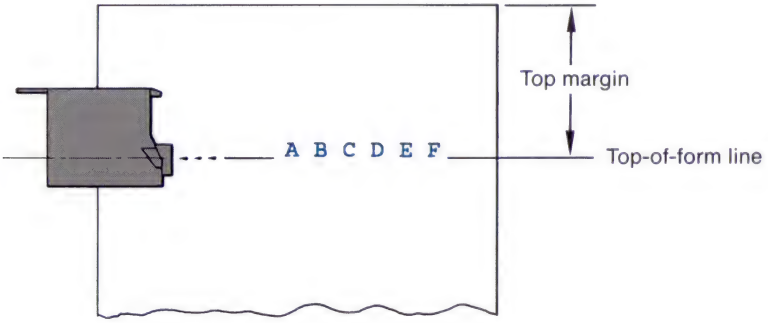
- With the printer ON, position the paper to the line where you want printing to begin. Press the **SET TOF** button.

Once you have set the top of form, pressing the **FF** button will advance the paper to the same line on each page. (If you move the paper with the knob, the place where top of form falls on the paper will change.)

NOTE: When the printer is ON but out of paper, the attention light will be ON. When paper is reloaded, the light will *blink* until you press the **SET TOF** button. (**LF** and **FF** are inactive until the **SET TOF** button is pressed.)

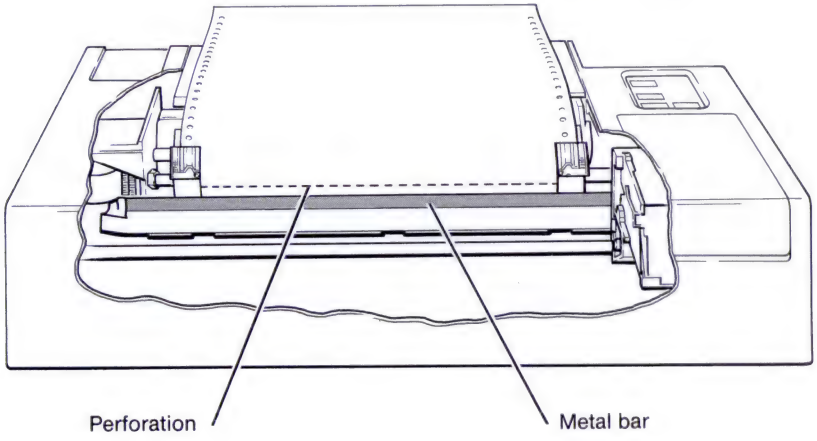
Setting a Top Margin with Software

The distance from top of form to the top of the page is the top margin.



Software packages usually set a top margin in terms of a specified number of lines, or inches, from the top of the page. The following example is based on this method. Refer to your software documentation for specific instructions.

1. Using your software, specify the number of lines, or inches, for the top margin (6 lines from the top would equal a one-inch margin).
2. Position the paper's perforation slightly above the metal bar at the base of the roller, as shown in the following figure.

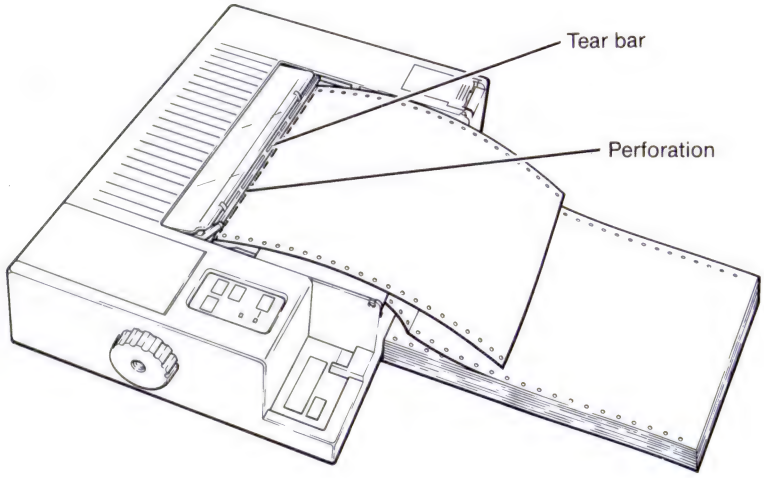


3. Set top of form.

Obtaining the margins that you desire *may require some experimenting with the top and bottom margin settings in your software.* In the alternative example below, the paper is positioned so that you may conveniently tear off the page.

1. Position the paper's perforation so that it falls just above the back edge of the paper bail, as shown in the following figure. (The back edge is sharp and functions as a tear bar.)

   Positioning the paper in this way will result in a top margin of about 1¼ inches. A form feed will advance the page so that its bottom perforation is conveniently located just above the tear bar.



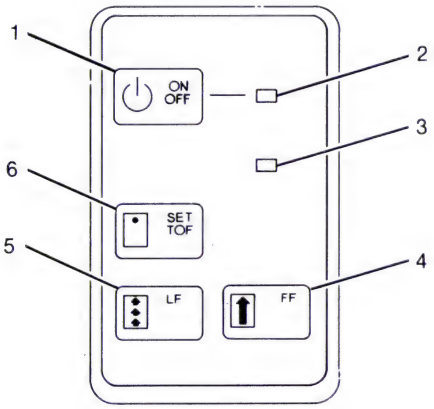
2. Using your software, specify zero lines for a top margin (or one inch less than the current setting, since the paper is already positioned where printing will begin). To compensate for the changed top margin, set the bottom margin to one inch more than the current setting.

3. Set top of form.

Control-Panel Button Functions

The following figure shows the buttons and lights on the printer's control panel. Each item is numerically keyed to the descriptive table on the next page.

Printer functions that require a two-button sequence are described on page 1-44.



Symbol	Name	Function
1.	**ON/OFF** button	Turns the printer on and off. See page 1-7.
2.	**ON/OFF** green light	When lit, indicates the printer's power is on.
3.	**ATTENTION** light	When lit, printer is out of paper. In this case the **SET TOF**, **LF**, and **FF** buttons are all inactive. Loading paper causes the attention light to blink and activates the **SET TOF** button. Pressing **SET TOF** activates **LF** and **FF**. This light also blinks if the carriage jams during printing. Remove any obstruction and recycle power. See *Printer Operation Problems* or *Paper Jam* in Chapter 3.
4.	**FF** button	Executes a form feed. Advances paper to the top of form on the next page. See page 1-39.
5.	**LF** button	Executes a line feed. Press once to advance paper one text line. Hold down to advance paper continuously.
6.	**SET TOF** button	Sets top of form, the line on the page where printing can begin. The distance from top of form to the top of the page equals the top margin. See page 1-39.

You can also activate other printer functions using a two-button sequence. With the printer OFF, hold down the indicated button while pressing and releasing the **ON/OFF** button. These functions are listed in the following table. For more information, refer to the pages listed.

Function	Buttons Used
Activate *transparency mode*. Use when transparency film is loaded. See page 1-17.	Turn printer OFF. *Hold down* **SET TOF** while pressing and releasing **ON/OFF**. Then release **SET TOF**.
Activate the printer's *self test*. Use this to determine if the printer is functioning properly. Also use it to assess print quality or to determine if a cartridge is out of ink. See pages 1-36 or 3-4–3-11.	Turn printer OFF. *Hold down* **FF** while pressing and releasing **ON/OFF**. Then release **FF**. Press **ON/OFF** again to stop output.
Output printer *demo* (first page) and *color spectrum* (second page). For more information on the color spectrum, see page 5-7.	Turn printer OFF. *Hold down* **LF** while pressing and releasing **ON/OFF**. Then release **LF**. Press **ON/OFF** again to stop output.

Selecting a Symbol Set

Of the printer's 12 symbol sets, two can be selected by setting the **ROM 8/PC 8** switch on the printer's rear panel: Roman8 and PC-8. (The switch is set for the PC-8 symbol set when the printer is shipped.)

If you want to change the setting, turn the printer OFF. Then set the **ROM 8/PC 8** switch on the printer's rear panel.

PC-8 setting

Roman8 setting

NOTE: The printer only "reads" the settings of the rear-panel switches when you turn it on. If you change any switch settings while the printer is on but do not turn the printer off and then on again, the new settings will be ignored by the printer. ■

A list of the printer's other symbol sets follows. Appendix B contains a brief description and illustration of the symbol sets.

US ASCII	Italian
French	United Kingdom
German	Norwegian 1
Spanish	Swedish Names
PC-8 (Danish/Norwegian)	ECMA-94

You may be able to select these symbol sets using your software package. If not, you can print these sets by using your computer to send escape sequences to the printer. To learn how to do this, refer to *Primary and Secondary Symbol Sets* in Chapter 4.

Default Print Settings

The following conditions are automatically established by the printer when you turn it on. Values that differ according to the setting of the **MET/ENG** switch are indicated.

- 10 characters per inch (Courier)
- 80 characters per line
- 6 lines per inch
- page length: 66 lines per page, English; 72 lines per page, metric
- text length: 60 lines per page, English; 66 lines per page, metric
- black text
- right and left margins (Z-fold paper): ¼ inch, English; 5 mm, metric
- perforation skip off
- graphics resolution: 90 dots per inch

Most software packages allow you to change the values from the ones listed above. Or, you can change them yourself by sending an escape sequence from your computer, as explained in Chapter 4.

Maintenance of the Printer

Maintenance of the printer is limited to periodic cleaning. It will perform best in a clean and dust-free environment. Observe the following environmental conditions.

- Operate only at temperatures from 60° F to 86° F (15° C to 30° C) and in relative humidity from 20% to 80%.
- Store at temperatures from −40° F to 158° F (−40° C to 70° C).

Clean the outer surface of your printer as follows.

- Blow away any lint and dust accumulation.
- Clean the outer plastic surface of the printer with a lint-free cloth or a sponge slightly dampened with water. Wipe off any residue, and dry with a soft, lint-free cloth. **Do not use abrasive cleaners, cleaning solvents, or strong detergents.**

2

Connecting Your Printer to a Computer

Your printer will work with most computers. However, the way to connect the printer to a computer will depend on the computer you are using. Specific instructions are provided for connecting your printer to the following computers.

- Apple Macintosh
- Macintosh Plus
- AT&T PC 6300
- HP 9000, Series 300
- HP Touchscreen (HP 150)
- HP Vectra
- IBM PC and PC/XT
- IBM AT
- Olivetti M24

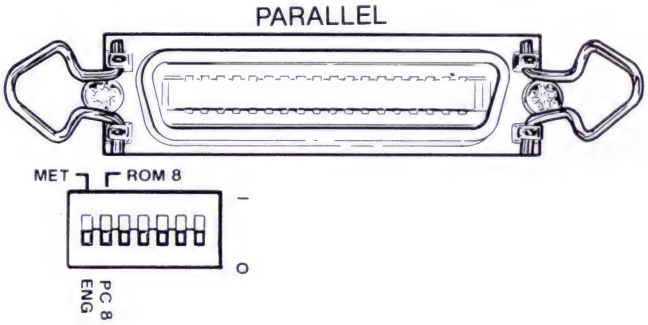
If your computer isn't listed here, it can probably still be connected to the printer. Consult your computer's documentation to determine how to connect it to peripheral devices.

Printer Interface Types

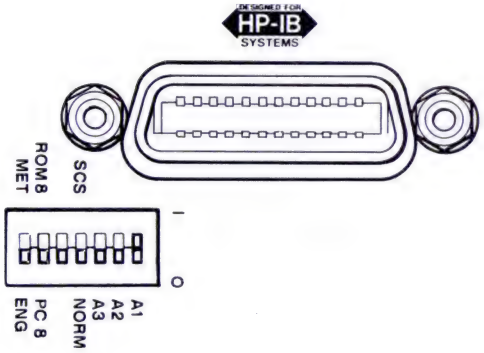
Your computer sends output to a printer via an *interface cable.* In addition to any text or graphics output, the computer can send formatting instructions telling a printer, for example, how many lines to print on each page. The computer can also tell the printer to activate features such as which color or symbol set to use.

Your printer has one of three interface types: a standard parallel interface, an HP-IB (IEEE-488) interface, or an RS-232-C serial interface. To determine which type you have, look at your printer's rear panel, where the name of the interface is printed. Compare the interface connector (port) and switches to the following figures. (Appendices C, D, and E contain additional information on all interfaces.)

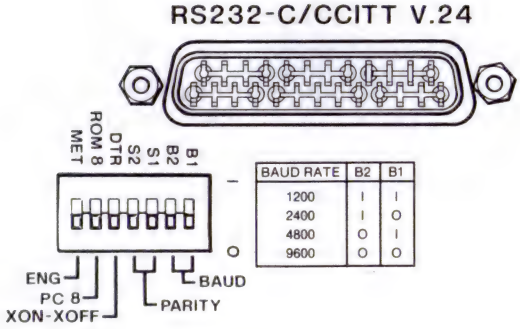
NOTE: All references to an RS-232-C interface in this manual apply equally to RS-232-C and CCITT V.24 interfaces. The term RS-232-C is used for purposes of simplicity. ■



Parallel Interface



HP-IB Interface



RS-232-C Interface

Using the Computer/Printer Interconnection Instructions

The following instructions are designed to help you get your computer and printer working together as soon as possible. Be aware that the computer and printer equipment listed for each interconnection is the *minimum necessary to establish communication.* Note that using an interface cable other than the one listed may prevent communication. Please verify that your printer and computer work individually before attempting to connect them.

Also, check your software documentation (or software supplier), for specific computer hardware and memory requirements. When you install the software, you may have to "configure" it. Refer to *A Note on Using Software* at the beginning of this manual and *Using Setup Strings with a Software Package* in Chapter 4 for information on using software.

Each set of interconnection instructions in this chapter has a simple test for verifying communication. After you have connected your computer and printer, you should run the test to make sure your computer is properly sending data to the printer.

For most examples, two methods of verifying communication are provided:

- printing a file directory or any other text displayed on the computer's screen.
- running a BASIC program that will print "COMMUNICATION OK."

If Your Computer Isn't Listed

Because of the large number of computers available, it isn't possible to include them all in the manual. Consult your computer documentation to determine how to use peripheral devices with the computer. In addition, you will need to determine which cable to use (your dealer or Hewlett-Packard salesperson can help you do this).

Apple Macintosh Computer (RS-232-C Interface)

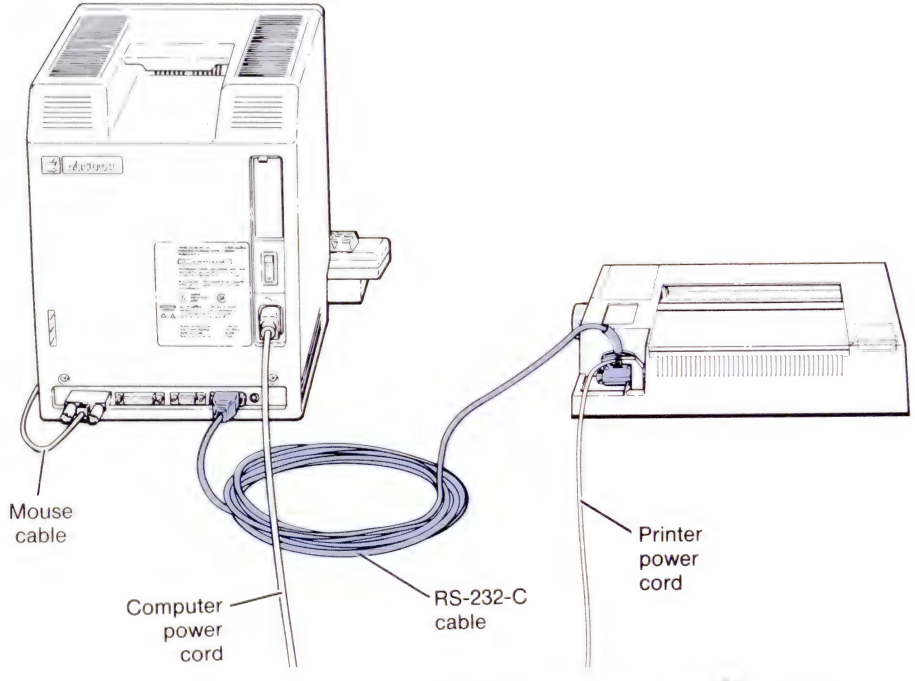
Computer Equipment	Printer Equipment
Macintosh computer with mouse Microsoft BASIC 2.0 or higher	HP PaintJet (RS-232-C) Serial cable (HP 92219M*)

*For most applications, you may also use the ImageWriter (Apple Part. No. M0150) cable or equivalent.

NOTE: Unless you are using BASIC, a PaintJet driver is required to run the Macintosh with PaintJet. Check with your computer dealer for the PaintJet drivers that are available. ■

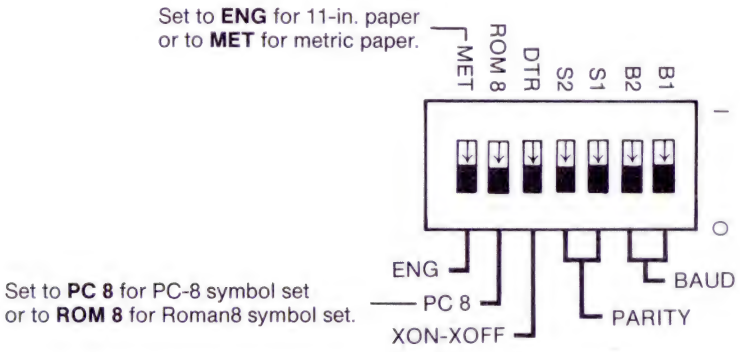
Interconnection Instructions

1. With your equipment off, connect the printer to the computer using the RS-232-C cable as shown below. Attach the small end of the cable to the computer port with the printer icon above it, and attach the other end of the cable to the connector on the printer.



2. Set the switches on the rear panel as shown in the following diagram. These settings establish 9600 baud with no parity.

   Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing switch settings.



3. Configure your computer system as follows. (Refer to your computer documentation if you have difficulty with this step.)

   a. Insert the System Disk (or System Tools disc if purchased after January 1, 1986) in the disc drive and turn on the computer.

   b. Select the "apple" icon from the menu bar, then select **CHOOSE PRINTER** from the "apple" icon menu.

   c. Under **PORT**, choose the Printer icon, then select **OK** to exit the system disc menu.

   d. Select **FILE** from the menu bar, then select **EJECT** from the file menu.

Verifying Communication with BASIC

To test the computer/printer interface, follow the steps below to enter and run a BASIC program. (If you need help doing this, refer to your computer documentation.)

1. Insert BASIC 2.0 or higher into the disc drive.
2. Select **FILE** from the menu bar, then select **OPEN** from the file menu. If prompted to do so, correct the date and time and press **Return**.
3. Choose the Microsoft® **BASIC** icon in the window.
4. Select **FILE** from the menu bar, and **OPEN** from the file menu. You should have a window, headed by LIST on your screen.
5. Enter the following BASIC program.

```
10 LPRINT CHR$(27)+"E"              'resets the printer
20 LPRINT "COMMUNICATION OK"
30 LPRINT CHR$(13)                  'carriage return
40 LPRINT CHR$(12)                  'form feed
50 END
```

6. Select **RUN** from the menu bar, and select **START** from the run menu. The printer should print COMMUNICATION OK.

Apple Macintosh Plus Computer
(RS-232-C Interface)

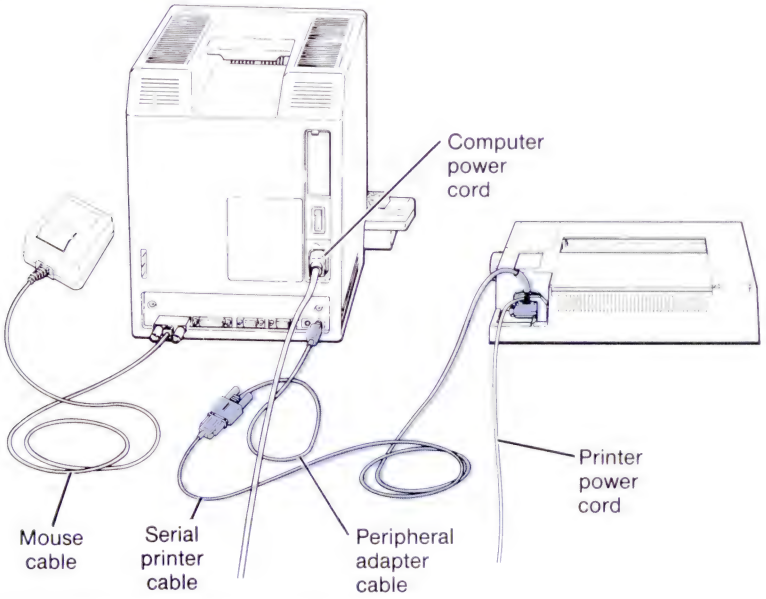
Computer Equipment	Printer Equipment
Macintosh Plus computer with mouse Microsoft BASIC 2.0 or higher	HP PaintJet (RS-232-C) Serial cable (HP 92219M*) Macintosh Plus peripheral adapter cable (Apple Part No. M0199)

*For most applications, you may also use the ImageWriter (Apple Part No. M0150) cable or equivalent.

NOTE: Unless you are using BASIC, a PaintJet driver is required to run the Macintosh Plus with PaintJet. Check with your computer dealer for the PaintJet drivers that are available. ■

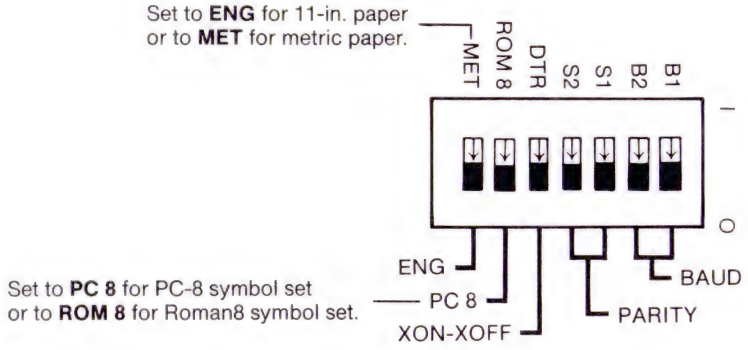
Interconnection Instructions

1. With your equipment turned off, attach the round end of the peripheral adapter cable to the computer port with the printer icon above it, and then attach the other end to the small end of the HP 92219M cable. Attach the remaining end of the HP 92219M cable to the connector on the printer.



2. Set the switches on the rear panel as shown in the following diagram. These settings establish 9600 baud with no parity.

   Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing switch settings.



3. Configure your computer system as follows. (Refer to your computer documentation if you have difficulty with this step.)

   a. Insert the System Tools disc in the disc drive and turn on the computer.

   b. Select the "apple" icon from the menu bar, then select **CHOOSER** from the "apple" icon menu.

   c. Select the printer icon under the words **Select printer port**. Then move to the printer icons and select the middle printer.

   d. Select **FILE** from the menu bar, then select **EJECT** from the file menu.

Verifying Communication with BASIC

To test the computer/printer interface, follow the steps below to enter and run a BASIC program. (If you need help doing this, refer to your computer documentation.)

1. Insert BASIC 2.0 or higher into the disc drive.
2. Select **FILE** from the menu bar, then select **OPEN** from the file menu. If prompted to do so, correct the date and time and press **Return**.
3. Choose the Microsoft® **BASIC** icon in the window.
4. Select **FILE** from the menu bar, and **OPEN** from the file menu. You should have a window, headed by LIST on your screen.
5. Enter the following BASIC program.

```
10 LPRINT CHR$(27)+"E"              'resets the printer
20 LPRINT "COMMUNICATION OK"
30 LPRINT CHR$(13)                  'carriage return
40 LPRINT CHR$(12)                  'form feed
50 END
```

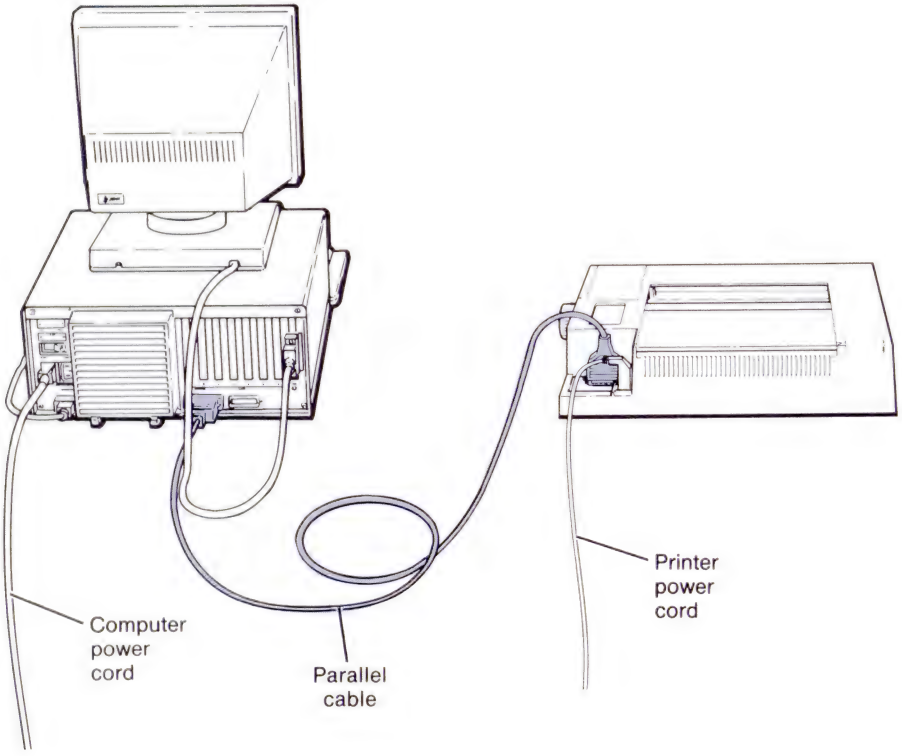
6. Select **RUN** from the menu bar, and select **START** from the run menu. The printer should print COMMUNICATION OK.

AT&T Personal Computer 6300
(Parallel Interface)

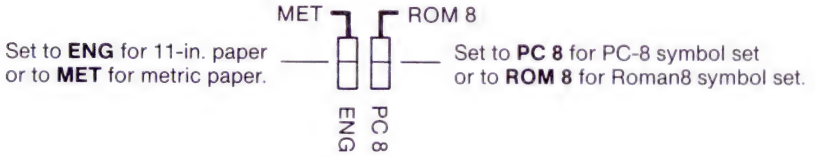
Computer Equipment	Printer Equipment
AT&T PC 6300 system unit with dual disk drive (flexible or fixed)	HP PaintJet (Parallel) Parallel printer cable (HP 92219K or equivalent)

Interconnection Instructions

1. With all equipment turned off, connect the printer to the computer using the parallel printer cable as shown below.



2. Set the switches on the rear panel for the desired symbol set and paper size, as shown below. Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing switch settings.



Verifying Communication

1. Make sure that only text (no graphics) appears on your computer screen.
2. Hold down the **Shift** (↑) key and press the **Prt Sc** key on the keyboard. Any text on the screen will print out.

   Any attempt to print graphics without software designed for this purpose will produce unpredictable results.

Verifying Communication with BASIC

Enter and run the following BASIC program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 LPRINT CHR$(27)+"E"              'resets the printer
20 LPRINT "COMMUNICATION OK"
30 LPRINT CHR$(13)                  'carriage return
40 LPRINT CHR$(12)                  'form feed
50 END
```

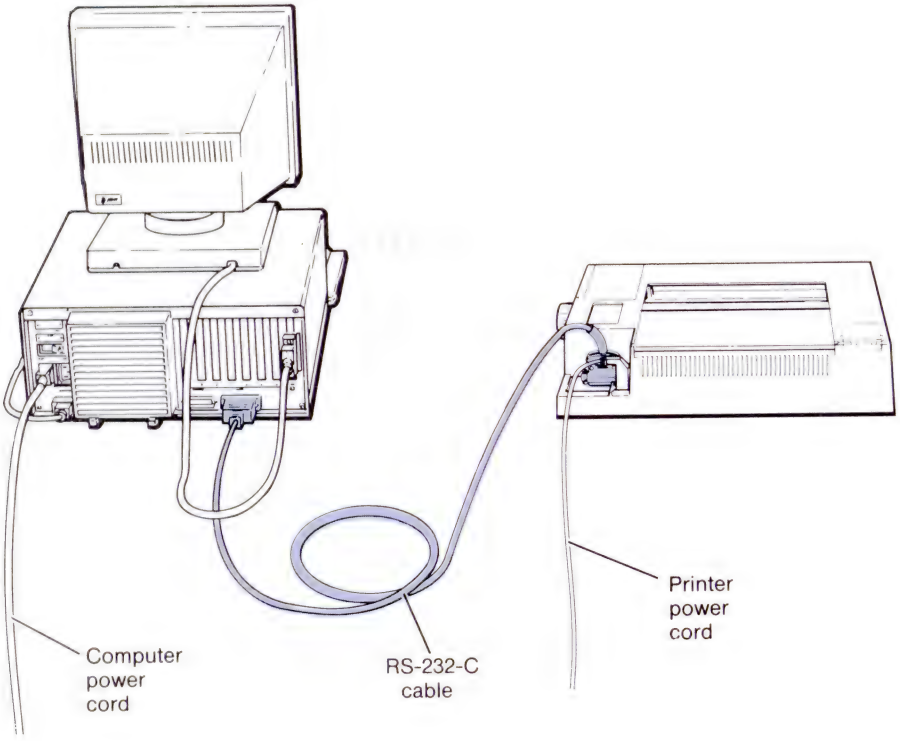
Your printer should print COMMUNICATION OK.

AT&T Personal Computer 6300
(RS-232-C Interface)

Computer Equipment	Printer Equipment
AT&T PC 6300 system unit with dual disk drive (flexible or fixed)	HP PaintJet (RS-232-C) RS-232-C cable (HP 17255D or equivalent)

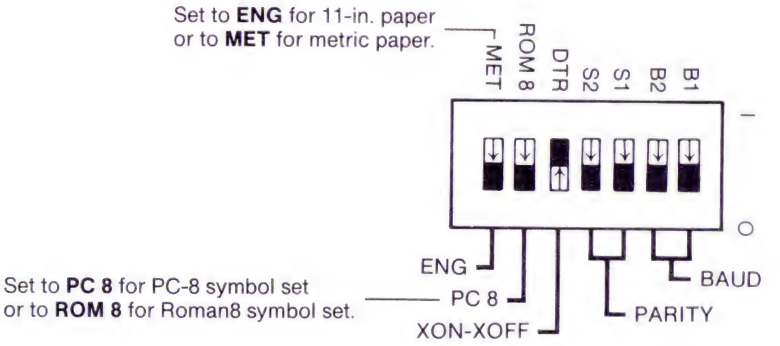
Interconnection Instructions

1. With your equipment turned off, connect the printer to the computer using the RS-232-C cable as shown below.



2. Set the switches on the rear panel as shown in the following diagram. These settings establish 9600 baud with no parity.

   Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing switch settings.



3. Configure your computer system as follows. (Refer to your computer documentation if you have difficulty with this step.)

   a. Load the operating system disc. Then type and enter `MODE COM1:9600,N,8,1,P` to set the serial port up for 9600 baud, no parity, 8 data bits, and 1 stop bit.

   b. Now type and enter `MODE LPT1:=COM1:` to redirect parallel printer output to the serial port.

Verifying Communication

1. Make sure that only text (no graphics) appears on your computer screen.

2. Hold down the **Shift** (↑) key and press the **Prt Sc** key on the keyboard. Any text on the screen will print out.

   Any attempt to print graphics without software designed for this purpose will produce unpredictable results.

Verifying Communication with BASIC

Enter and run the following BASIC program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 LPRINT CHR$(27)+"E"              'resets the printer
20 LPRINT "COMMUNICATION OK"
30 LPRINT CHR$(13)                  'carriage return
40 LPRINT CHR$(12)                  'form feed
50 END
```

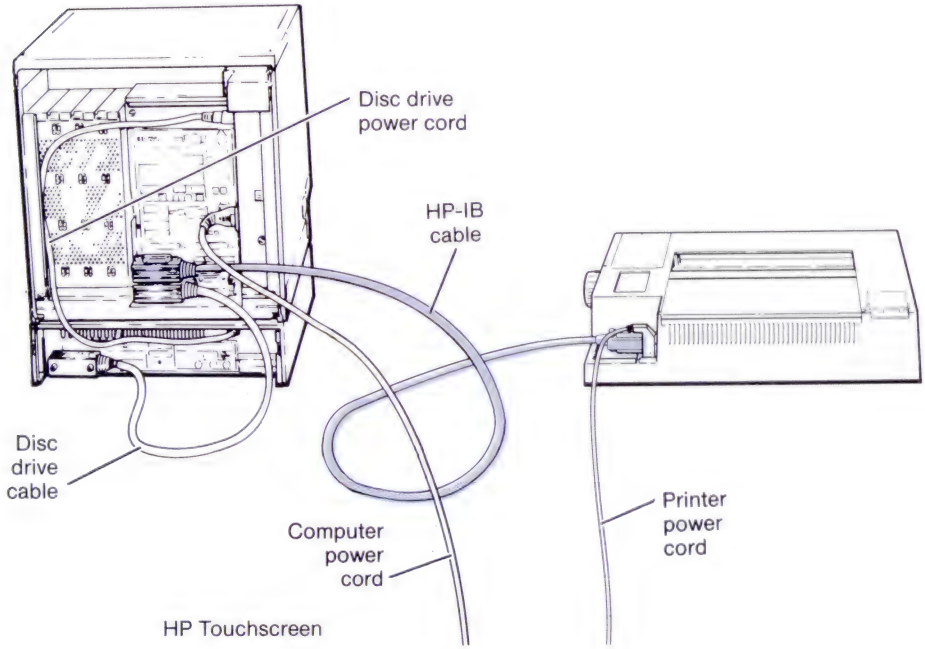
Your printer should print COMMUNICATION OK.

HP Touchscreen Personal Computer (HP 150)
(HP-IB Interface)

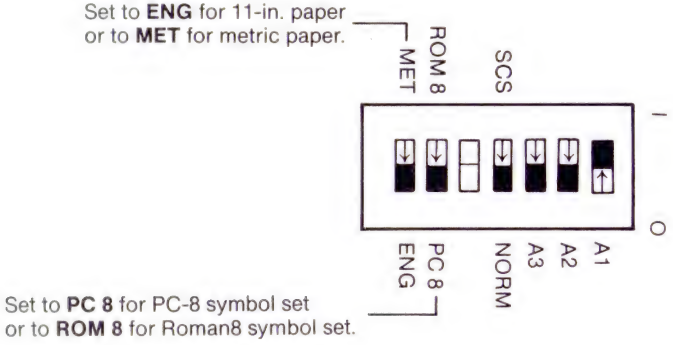
Computer Equipment	Printer Equipment
HP 150, HP Touchscreen or Touchscreen MAX, HP Touchscreen II, or HP Touchscreen II MAX system (including dual disc drive (flexible or fixed) and MS-DOS.	HP PaintJet (HP-IB) HP-IB cable (HP 10833A, B, C, or D)

Interconnection Instructions

With your equipment turned off, connect the printer to the computer using the HP-IB cable as shown below. Either end of the cable can be connected to the printer or computer.



2. Set the switches on the rear panel of your printer as shown in the following diagram. Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing switch settings.



3. Configure your computer system as follows. (Refer to your computer documentation if you have difficulty with this step.)

   a. Load the MS-DOS System Disc. When P.A.M. comes up on the screen, select **DEVICE CONFIG**. Then select **Start Applic** to display the Device Configuration screen.

   b. Locate and select the fields for device **PRN**. Then use the **Next Choice** key to select **Interface: HP-IB; Address: 1; Model: Other**. Next, select **Save Config**.

   c. Press the **Exit CONFIG** key to return to P.A.M.

Verifying Communication

1. From P.A.M., press a system softkey to select **MSDOS**. Then select **Start Applic**.

2. When the A> prompt appears, press the **User/System** key until **device control** appears on the menu.

3. Press the **device control** softkey, then the **"to" devices** softkey.

4. Press the **HP-IB DEVICE** softkey so that the asterisk is displayed on the menu (**HP-IB DEVICE***).

5. Make sure that only text (no graphics) appears on your computer screen.

6. Hold down the **Shift** key and press the **Print** key on the computer's keyboard. Any text on the screen will print out.

   Any attempt to print graphics without software designed for this purpose will produce unpredicatble results.

Verifying Communication with BASIC

Enter and run the following BASIC program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 LPRINT CHR$(27)+"E"              'resets the printer
20 LPRINT "COMMUNICATION OK"
30 LPRINT CHR$(13)                  'carriage return
40 LPRINT CHR$(12)                  'form feed
50 END
```

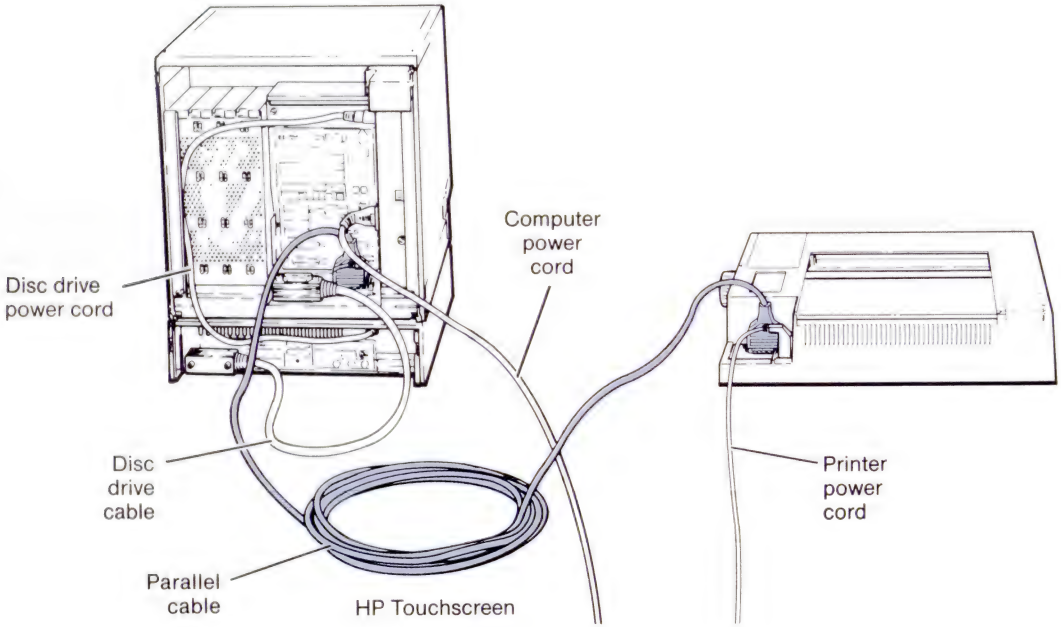
Your printer should print COMMUNICATION OK.

HP Touchscreen Personal Computer (HP 150)
(Parallel Interface)

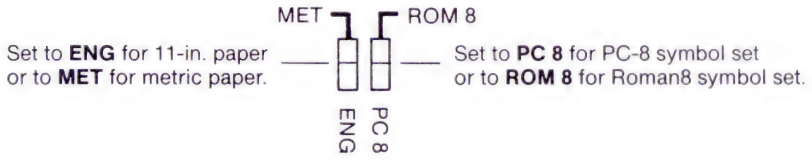
Computer Equipment	Printer Equipment
HP 150, HP Touchscreen or Touchscreen MAX, HP Touchscreen II, or HP II MAX system (including dual disc drive (flexible or fixed) and MS-DOS. Extended I/O Accessory Card (HP Part No. 45643A)	HP PaintJet (Parallel) Parallel printer cable HP 13242D or equivalent

Interconnection Instructions

1. Be sure all equipment is turned off. If you have not already done so, install the Extended I/O Accessory Card in your computer (refer to your computer documentation for details).
2. Connect the printer to the computer using the parallel printer cable as shown below.



3. Set the switches on the rear panel for the desired symbol set and paper size, as shown below. Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing switch settings.



4. Configure your computer system as follows. *If you have MS-DOS version 2.01*, continue with the following steps to configure the computer. *If you have MS-DOS version 2.11 or higher*, skip to the next section.

Configuration for MS-D0S Version 2.01

a. If you are using a dual floppy disc drive, place your working System Master disc in drive A and your Extended I/O Applications disc in drive B. If you are using a hard disc drive, place your Extended I/O Applications disc in drive B.

b. Turn on the printer and computer. From the P.A.M. menu, select **EXTENDIO**, then **Start Applic**.

c. Type A. Then press the **Return** key.

d. Select **Add Parallel** to add the parallel printer software to your working System Master. (If HP-IL software is currently on your working System Master disc, adding the parallel software will automatically remove the HP-IL.)

e. Select **EXIT** to return to P.A.M.

f. Perform a hard reset by holding down the **Shift** and **CTRL** keys and pressing the **Reset** key to reload the system software and the parallel printer software. Your printer is now the PRN printer in your system regardless of what appears in DEVICE CONFIG. For any other printer on the system to function, it will need to be configured as the LST device. To properly configure the LST device, run the Device Config program on your System Master as explained in your computer documentation.

Configuration for MS-DOS Version 2.11 (or higher)

a. If you are using a dual floppy disc drive, place your working System Master disc in drive A and your Extended I/O Applications disc in drive B. If you are using a hard disc drive, place your Extended I/O Applications disc in drive B.

b. Turn on the printer and computer. From the P.A.M. menu, select **DEVICE CONFIG**, then **Start Applic**.

c. Select the **PRN:** Interface field and set it to **Parallel** using the **Previous Choice** or **Next Choice** keys.

d. Select the **PRN:** Model field and set it to **Other** using the **Previous Choice** or **Next Choice** keys.

e. Touch **Save Config**, then **Exit CONFIG**.

Verifying Communication

1. From P.A.M., select **MSDOS COMMANDS**, then select **Start Applic**.
2. When the A> prompt appears, type **dir>prn** and then press the **Return** key. This will cause the directory of disc A to be printed.

Verifying Communication with BASIC

Enter and run the following BASIC program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 LPRINT CHR$(27)+"E"          'resets the printer
20 LPRINT "COMMUNICATION OK"
30 LPRINT CHR$(13)              'carriage return
40 LPRINT CHR$(12)              'form feed
50 END
```

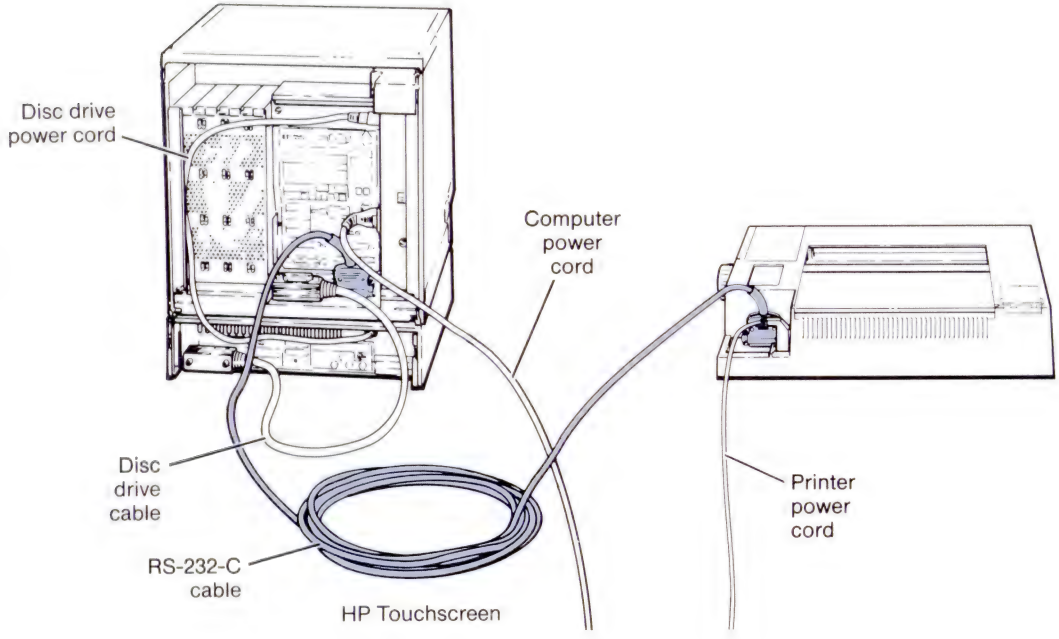
Your printer should print COMMUNICATION OK.

HP Touchscreen Personal Computer (HP 150)
(RS-232-C Interface)

Computer Equipment	Printer Equipment
HP 150, HP Touchscreen or Touchscreen MAX, HP Touchscreen II, or HP II MAX system (including dual disc drive (flexible or fixed) and MS-DOS.	HP PaintJet (RS-232-C) RS-232-C cable (HP 17255M, 13242G, 13242-60010 or equivalent)

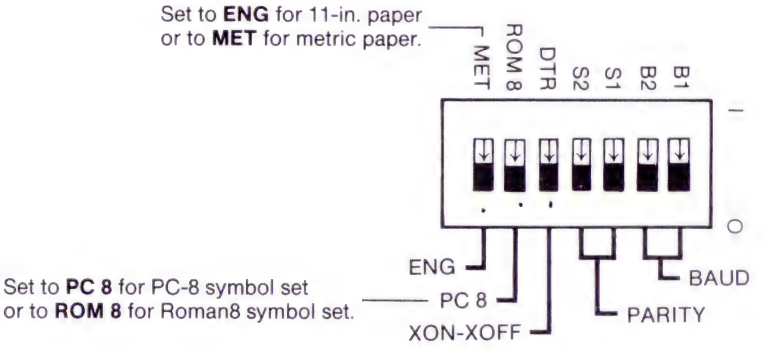
Interconnection Instructions

1. With your equipment turned off, connect the printer to port 2 of the computer using the RS-232-C cable as shown below. Either end of the cable can be connected to the printer or computer.



2. Set the switches on the rear panel as shown in the following diagram. These settings establish 9600 baud with no parity.

   Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing switch settings.



3. Configure your computer system as follows. (Refer to your computer documentation if you have difficulty with this step.)

   a. Load the MS-DOS System Disc. Select **DEVICE CONFIG**. Then select **Start Applic** to display the Device Configuration screen.

   b. Locate and select the fields for device **PRN**. Then use the **Next Choice** key to select **Interface: Port2; Model: Other**. Next, touch **Save Config**.

   c. Press the **User/System** key on your keyboard twice to change the function key selections. Then select **config keys**.

   d. Select the **Port2 config** field to display the Port 2 screen. Press the **system defaults** key, then the **DEFAULT VALUES** key. Use **NEXT CHOICE** key to select **BaudRate 9600, Parity None, DataBits 8**. Then use the cursor controls to select the CS(CB)XMIT field. Use the **NEXT CHOICE** key to set the field to **YES**.

   e. Select **SAVE CONFIG** to save the new configuration. Hold down the **Shift** key and press the **User/System key**. Press the **Exit CONFIG** to return to P.A.M.

Verifying Communication

1. From P.A.M., press a system softkey to select **MSDOS**. Then select **Start Applic**.
2. When the A> prompt appears, press the **User/System** key until **device control** appears on the menu.
3. Press the **device control** softkey, then the **"to" devices** softkey.
4. Press the **SERIAL DEVICE** softkey so that the asterisk is displayed on the menu (**SERIAL DEVICE***).
5. Make sure that only text (no graphics) appears on your computer screen.
6. Hold down the **Shift** and **Print** keys on the computer's keyboard. Any text on the screen will print out.

   Any attempt to print graphics without software designed for this purpose will produce unpredictable results.

Verifying Communication with BASIC

Enter and run the following BASIC program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 LPRINT CHR$(27)+"E"              'resets the printer
20 LPRINT "COMMUNICATION OK"
30 LPRINT CHR$(13)                  'carriage return
40 LPRINT CHR$(12)                  'form feed
50 END
```

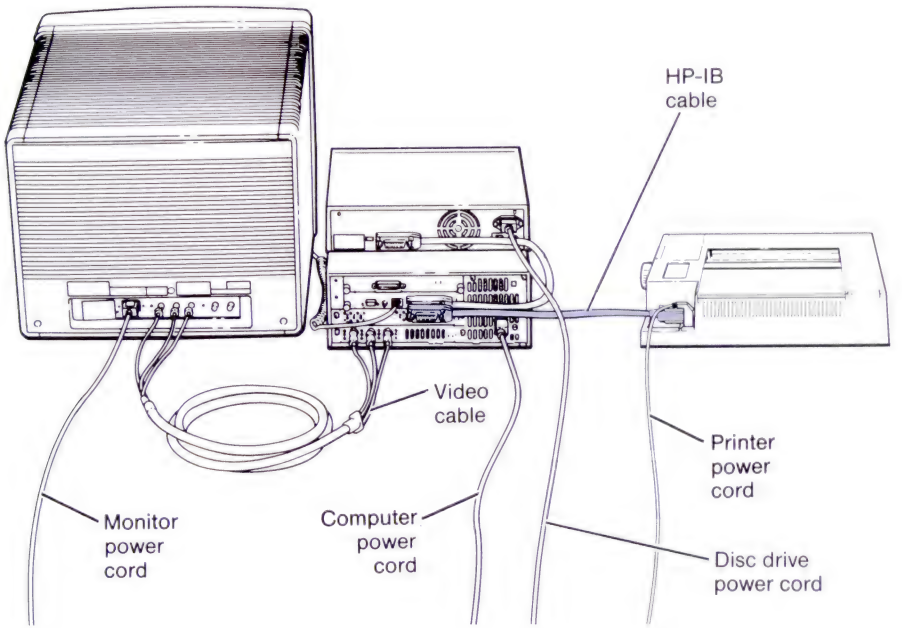
Your printer should print COMMUNICATION OK.

HP 9000, Series 300 Technical Computer
(HP-IB Interface)

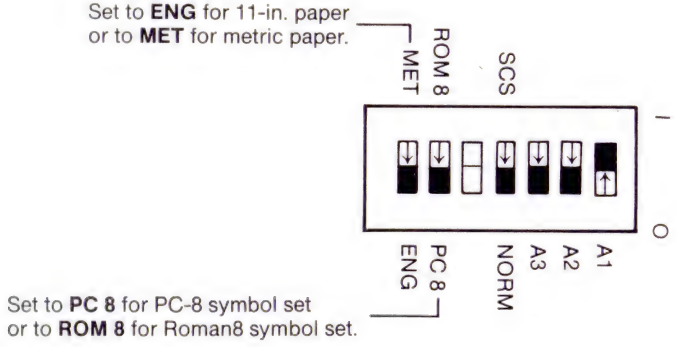
Computer Equipment	Printer Equipment
HP Model 310 or 320 computer system	HP PaintJet (HP-IB) HP-IB cable (HP 10833A, B, C, or D)

Interconnection Instructions

1. With your equipment turned off, connect the printer to the computer using the HP-IB cable as shown below. Either end of the cable can be connected to the printer or computer. The illustration below shows an HP Model 320 connected to the printer.



2. Set the switches on the rear panel of your printer as shown in the following diagram. Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing switch settings.



Verifying Communication with BASIC

Enter and run the following BASIC program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 PRINTER IS 701              !sends output to address 1
20 PRINT CHR$(27)&"E"          !resets the printer
30 PRINT "COMMUNICATION OK"
40 PRINT CHR$(13)              !carriage return
50 PRINT CHR$(12)              !form feed
60 END
```

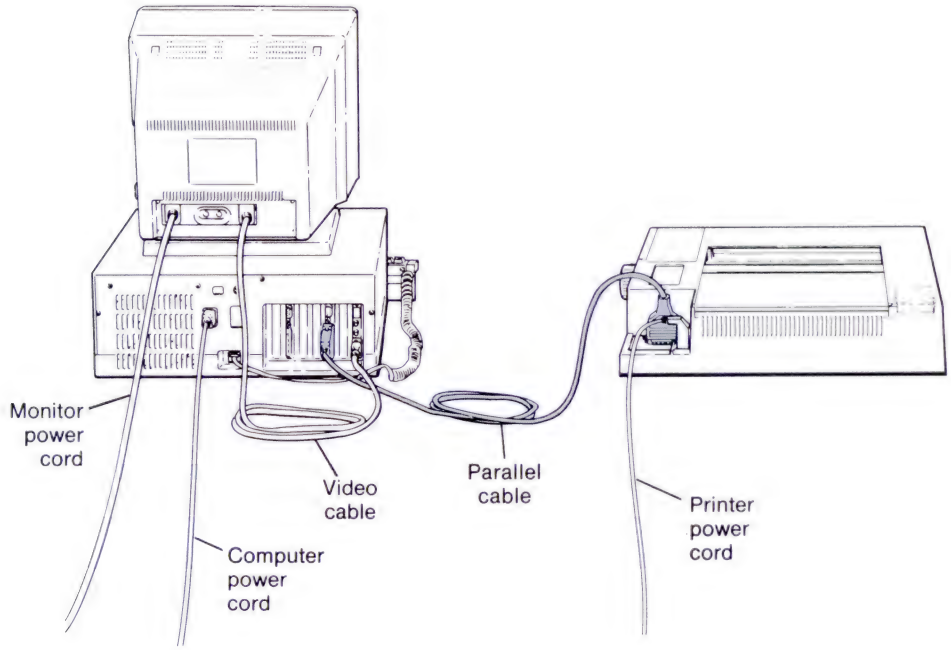
Your printer should print COMMUNICATION OK.

HP Vectra Personal Computer (Parallel Interface)

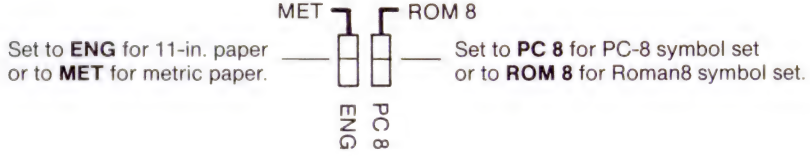
Computer Equipment	Printer Equipment
HP Vectra PC with 256K Graphics monitor (color or b&w) Disc drive HP Serial/Parallel Interface Card (HP 24540A)	HP PaintJet (Parallel) Parallel printer cable (HP 92219K or equivalent)

Interconnection Instructions

1. Install the Serial/Parallel Interface Card in your Vectra PC. (refer to your HP Vectra documentation for instructions on installation).
2. With your equipment turned off, connect the printer to the computer using the parallel printer cable as shown below.



3. Set the switches on the rear panel of your printer as shown in the following diagram. Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing switch settings.



Verifying Communication

1. Make sure that only text (no graphics) appears on your computer screen.
2. Hold down the **Shift** (↑) key and press the **Prt Sc** key on the keyboard. Any text on the screen will print out.

   Any attempt to print graphics without software designed for this purpose will produce unpredictable results.

Verifying Communication with BASIC

Enter and run the following BASIC program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 LPRINT CHR$(27)+"E"              'resets the printer
20 LPRINT "COMMUNICATION OK"
30 LPRINT CHR$(13)                  'carriage return
40 LPRINT CHR$(12)                  'form feed
50 END
```

Your printer should print COMMUNICATION OK.

HP Vectra Personal Computer
(RS-232-C Interface)

Computer Equipment	Printer Equipment
HP Vectra PC with 256K Graphics monitor (color or b&w) Disc Drive HP Serial/Parallel Interface Card (HP 24540A)* or HP Dual Serial Interface Card (HP 24541A)**	HP PaintJet (RS-232-C) RS-232-C cable (use appropriate cable for interface card)

*Use with the HP 24542G special 9-25 pin cable.

**If you are using the 9-pin connector, use the HP 24542G special 9-25 pin cable. If you are using the 25-pin connector, use the HP 17255M, the 13242-60010, the 13242G cable or equivalent.

Interconnection Instructions

1. With all equipment turned off, install the interface card in your Vectra PC (refer to your computer documentation for instructions on installation).

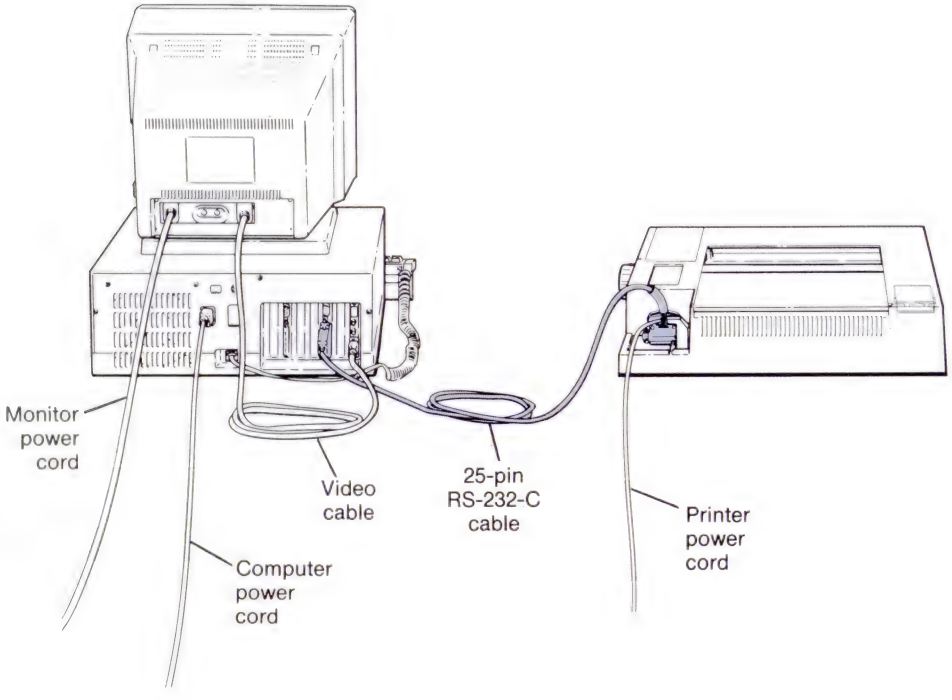
2. Connect the printer to the computer using the RS-232-C cable, as shown in the next illustration.

   If you are using the HP 24540A Serial/Parallel Interface Card, connect the small end of the HP 24542G cable to the 9-pin connector on the back of the computer, and attach the other end of the cable to the printer.

   If you are using the HP 24541A Dual Interface Card, use the 9-pin HP 24542G cable or one of the 25-pin cables listed in the table's footnote.

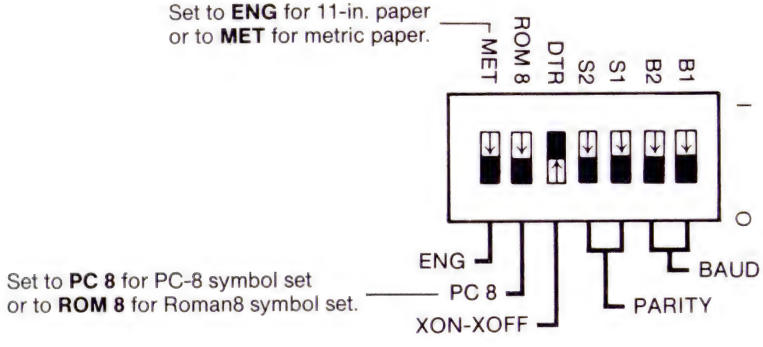
   - To use a 25-pin cable, attach one end of the cable to the 25-pin connector on the computer, and the other end of the cable to the printer.

   - To use the HP 24542G cable, attach the small end of the cable to the 9-pin connector on the computer, and attach the other end of the cable to the printer.



3. Set the switches on the rear panel as shown in the following diagram. These settings establish 9600 baud with no parity.

   Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing switch settings.



4. Configure your computer system as follows. (Refer to your computer documentation if you have difficulty with this step.)

   a. Load the operating system disc. Then type and enter `MODE COM1:9600,N,8,1,P` to set the communications port up for 9600 baud, no parity, 8 data bits, and 1 stop bit.

   b. Now type and enter `MODE LPT1:=COM1:` to redirect parallel printer output to the serial port.

      NOTE: If you are using the 9-pin connector on the HP 24541A Dual Serial Interface Card, replace `COM1` with `COM2` in steps a and b above. ■

Verifying Communication

1. Make sure that only text (no graphics) appears on your computer screen.

2. Hold down the **Shift** (↑) key and press the **Prt Sc** key on the keyboard. Any text on the screen will print out.

   Any attempt to print graphics without software designed for this purpose will produce unpredictable results.

Verifying Communication with BASIC

Enter and run the following BASIC program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 LPRINT CHR$(27)+"E"              'resets the printer
20 LPRINT "COMMUNICATION OK"
30 LPRINT CHR$(13)                  'carriage return
40 LPRINT CHR$(12)                  'form feed
50 END
```

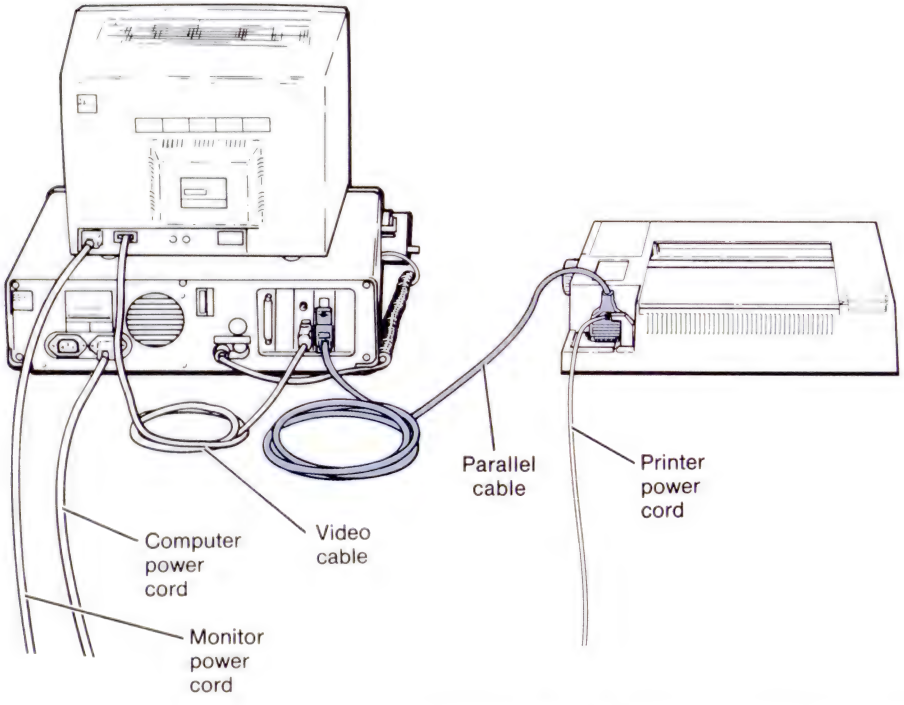
Your printer should print COMMUNICATION OK.

IBM Personal Computer (PC AND PC-XT)
(Parallel Interface)

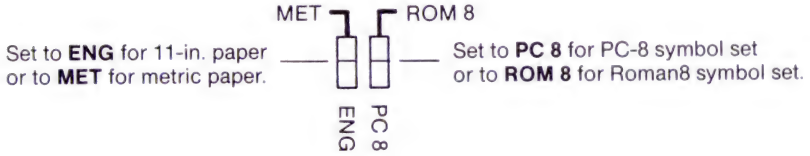
Computer Equipment	Printer Equipment
IBM system unit Graphics monitor (color or b&w) Diskette drive and adapter IBM Parallel Printer Interface Adapter	HP PaintJet (Parallel) Parallel printer cable (HP 92219K or equivalent)

Interconnection Instructions

1. Install the Parallel Printer Interface Adapter in your IBM PC (refer to your IBM documentation for instructions on installation).
2. With your equipment turned off, connect the printer to the computer using the parallel printer cable as shown below.



3. Set the switches on the rear panel of your printer as shown in the following diagram. Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing switch settings.



Verifying Communication

1. Make sure that only text (no graphics) appears on your computer screen.
2. Hold down the **Shift** (↑) key and press the **PrtSc** key on the keyboard. Any text on the screen will print out.

   Any attempt to print graphics without software designed for this purpose will produce unpredictable results.

Verifying Communication with BASIC

Enter and run the following BASIC program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 LPRINT CHR$(27)+"E"              'resets the printer
20 LPRINT "COMMUNICATION OK"
30 LPRINT CHR$(13)                  'carriage return
40 LPRINT CHR$(12)                  'form feed
50 END
```

Your printer should print COMMUNICATION OK.

IBM Personal Computer (PC and PC-XT)
(RS-232-C Interface)

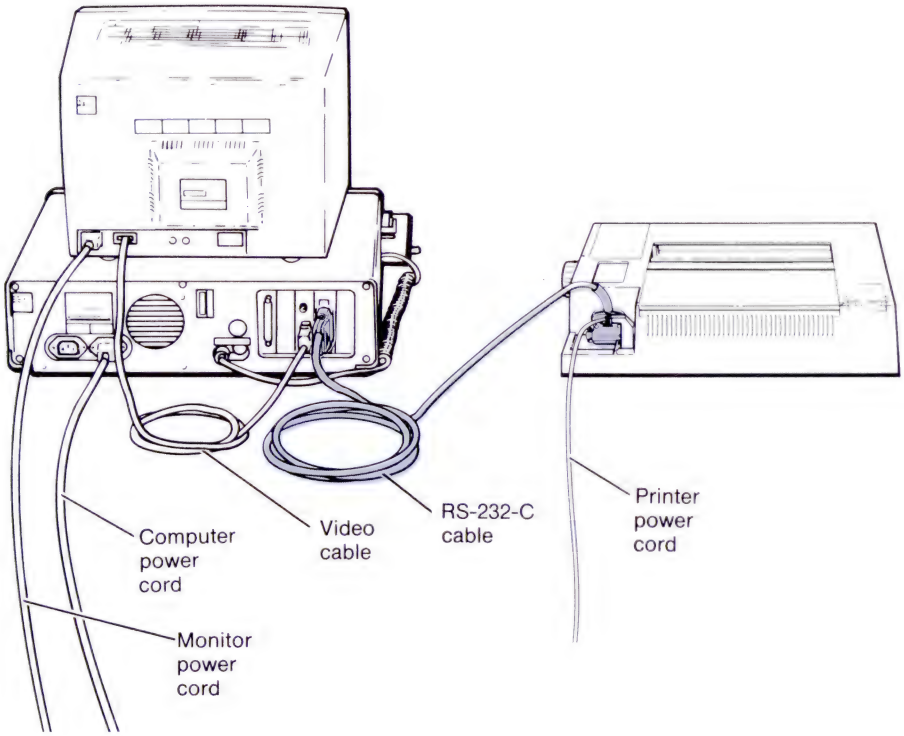
Computer Equipment	Printer Equipment
IBM system unit Graphics monitor (color or b&w) Diskette drive and adapter Asynchronous Communications Adapter (standard on the PC-XT)	HP PaintJet (RS-232-C) RS-232-C cable (HP 17255D or equivalent)

Interconnection Instructions

1. Install the Asynchronous Communications Adapter in your IBM PC (refer to your IBM documentation for instructions on installation).

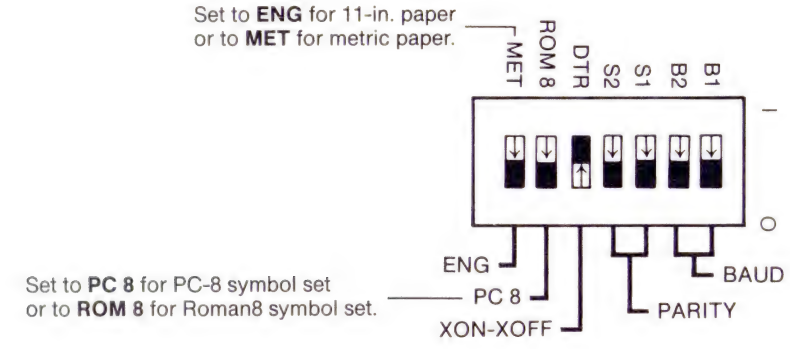
   NOTE: If you have two Asynchronous Communications Adapters installed in your computer, one of the adapters must be set for COM1 and the other for COM2. (Refer to your computer documentation for details.) The interconnection instructions listed here assume you will be connecting your printer to the COM1 adapter. ■

2. With your equipment turned off, connect the printer to the computer using the HP RS-232-C cable as shown in the following illustration.



3. Set the switches on the rear panel as shown in the following diagram. These settings establish 9600 baud with no parity.

   Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing switch settings.



4. Configure your computer system as follows. (Refer to your computer documentation if you have difficulty with this step.).

   a. Load the operating system disc. Then type and enter `MODE COM1:9600,N,8,1,P` to set the serial port up for 9600 baud, 8 data bits, 1 stop bit, and no parity.

   b. Type and enter `MODE LPT1:=COM1:` to redirect parallel printer output to the asynchronous communications adapter.

Verifying Communication

1. Make sure that only text (no graphics) appears on your computer screen.

2. Hold down the **Shift** (↑) key and press the **PrtSc** key on the keyboard. Any text on the screen will print out.

   Any attempt to print graphics without software designed for this purpose will produce unpredictable results.

Verifying Communication with BASIC

Enter and run the following BASIC program. (If you need help doing this, refer to your computer documentation.)

```
10 LPRINT CHR$(27)+"E"              'resets the printer
20 LPRINT "COMMUNICATION OK"
30 LPRINT CHR$(13)                  'carriage return
40 LPRINT CHR$(12)                  'form feed
50 END
```

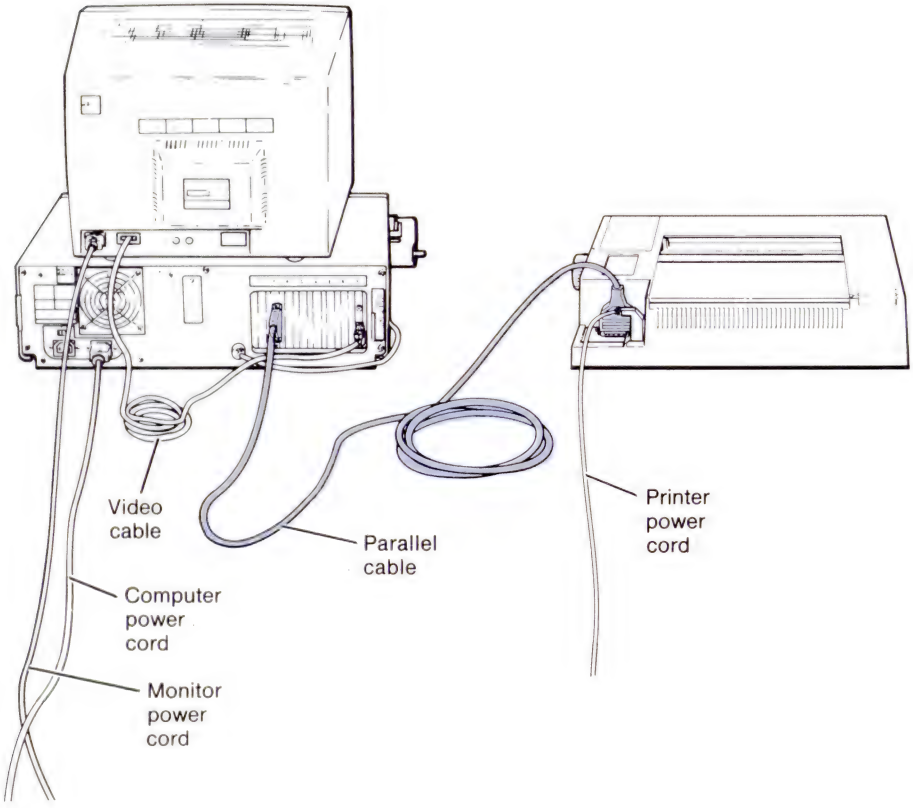
Your printer should print COMMUNICATION OK.

IBM AT Personal Computer (Parallel Interface)

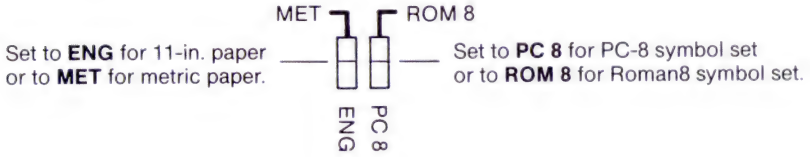
Computer Equipment	Printer Equipment
IBM AT system unit Graphics monitor (color or b&w) IBM Color/Graphics Adapter	HP PaintJet (Parallel) Parallel printer cable (HP 92219K or equivalent)

Interconnection Instructions

1. With your equipment turned off, connect the printer to the computer using the parallel printer cable as shown below.



2. Set the switches on the rear panel of your printer as shown in the following diagram. Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing the switch settings.



Verifying Communication

1. Make sure that only text (no graphics) appears on your computer screen.
2. Hold down the **Shift** (↑) key and press the **PrtSc** key on the keyboard. Any text on the screen will print out.

   Any attempt to print graphics without software designed for this purpose will produce unpredictable results.

Verifying Communication with BASIC

Enter and run the following BASIC program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 LPRINT CHR$(27)+"E"              'resets the printer
20 LPRINT "COMMUNICATION OK"
30 LPRINT CHR$(13)                  'carriage return
40 LPRINT CHR$(12)                  'form feed
50 END
```

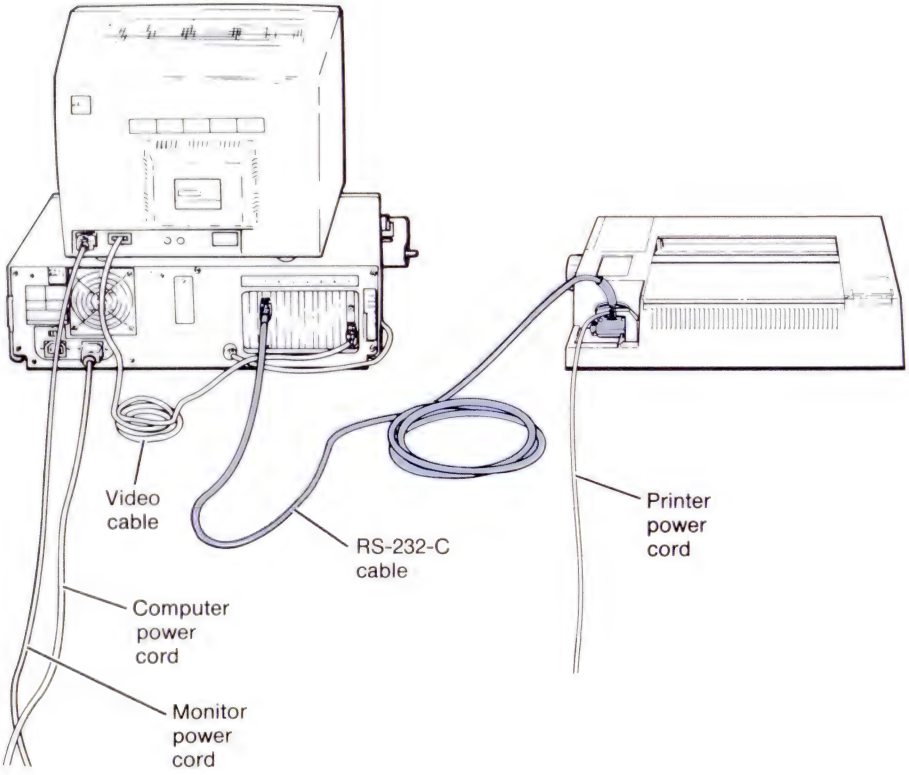
Your printer should print COMMUNICATION OK.

IBM AT Personal Computer (RS-232-C Interface)

Computer Equipment	Printer Equipment
IBM AT system unit Graphics monitor (color or b&w) Diskette drive and adapter	HP PaintJet (RS-232-C) RS-232-C cable (HP 24542G or equivalent)

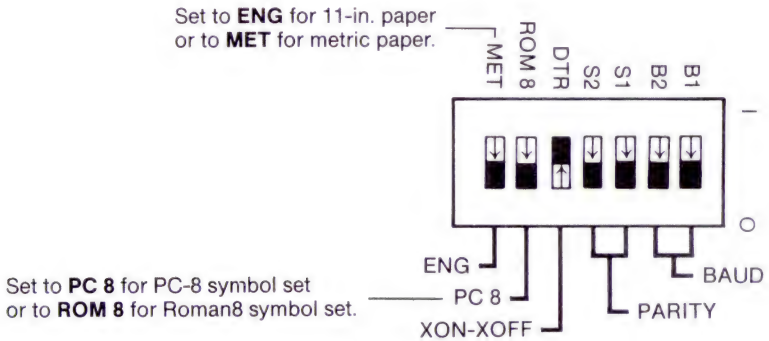
Interconnection Instructions

1. With your equipment turned off, connect the printer to the computer using the RS-232-C cable as shown below. The small 9-pin connector on the cable connects to the 9-pin serial port on the back of the IBM AT.



2. Set the switches on the rear panel as shown in the following diagram. These settings establish 9600 baud with no parity.

   Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing switch settings.



3. Configure your computer system as follows. (Refer to your computer documentation if you have difficulty with this step.)

   a. Load the operating system disc, then type and enter `MODE COM1:9600,N,8,1,P` to set the communications port up for 9600 baud, no parity, 8 data bits, and 1 stop bit.

   b. Now type `MODE LPT1:=COM1:` to redirect parallel printer output to the serial port.

Verifying Communication

1. Make sure that only text (no graphics) appears on your computer screen.

2. Hold down the **Shift** (↑) key and press the **PrtSc** key on the keyboard. Any text on the screen will print out.

   Any attempt to print graphics without software designed for this purpose will produce unpredictable results.

Verifying Communication with BASIC

Enter and run the following BASIC program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 LPRINT CHR$(27)+"E"              'resets the printer
20 LPRINT "COMMUNICATION OK"
30 LPRINT CHR$(13)                  'carriage return
40 LPRINT CHR$(12)                  'form feed
50 END
```

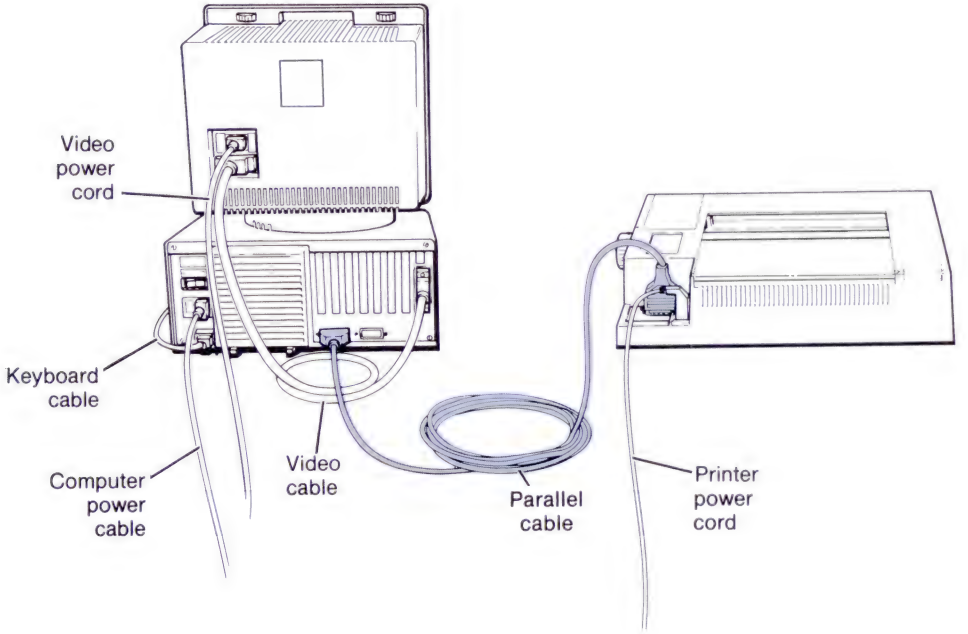
Your printer should print COMMUNICATION OK.

Olivetti M24 Computer (Parallel Interface)

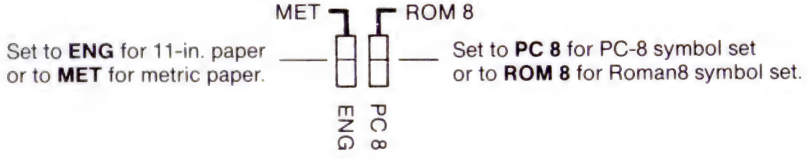
Computer Equipment	Printer Equipment
Olivetti M24 system unit with Parallel Interface Adapter	HP PaintJet (Parallel) Parallel printer cable (HP 92219K or equivalent)

Interconnection Instructions

1. Install the Parallel Interface Adapter in your Olivetti M24 PC (refer to your computer documenation for instructions on installation).
2. With your equipment turned off, connect the printer to the computer using the parallel printer cable as shown below.



3. Set the switches on the rear panel of your printer as shown in the following diagram. Your printer checks the switch settings only when you turn it on, so be sure the printer is turned off before changing switch settings.



Verifying Communication

1. Make sure that only text (no graphics) appears on your computer screen.
2. Hold down the **Shift** (↑) key and press the **Prt Sc** key on the keyboard. Any text on the screen will print out.

   Any attempt to print graphics without software designed for this purpose will produce unpredictable results.

Verifying Communication with BASIC

Enter and run the following BASIC program. (If you need help entering and running the program, refer to your computer documentation.)

```
10 LPRINT CHR$(27)+"E"              'resets the printer
20 LPRINT "COMMUNICATION OK"
30 LPRINT CHR$(13)                  'carriage return
40 LPRINT CHR$(12)                  'form feed
50 END
```

Your printer should print COMMUNICATION OK.

3

Troubleshooting

This chapter will help you correct some of the most common problems that might occur in day-to-day operation of the printer. The chapter is divided into the following sections.

Important Information about the Print Cartridges

Troubleshooting the Print Cartridges

Out of Ink?

Printer Operation Problems
- Printer Does Not Turn On
- Carriage Moves but Printer Does Not Print
- Carriage Motion Ceases and Attention Light Blinks
- Attention Light On Continuously
- Green Power Light Goes On and Off
- Self Test Does Not Work

Paper Jam

Printer/Computer Communication Problems

Software Problems

Print Quality Problems

NOTE: If you were directed to this chapter from step 6 on the printer's Help Card (and have already primed and wiped a cartridge twice), go directly to step 6 on page 3-8. ■

Important Information about the Print Cartridges

When used with PaintJet paper, the ink supply in a black print cartridge will last for about 1100 text pages. For color graphics, the number of pages generated per cartridge will vary greatly due to the difference in graphics applications. For additional information on print cartridge duration, refer to *Out of Ink?* in this chapter.

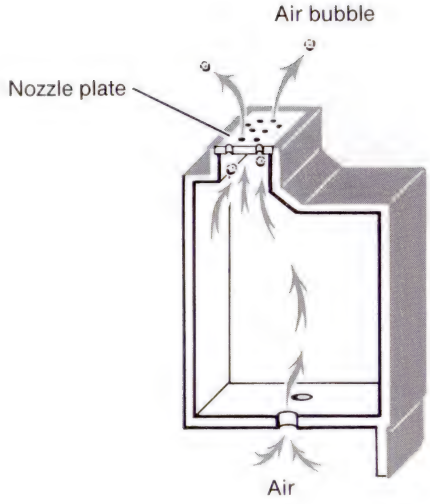
The print cartridges are designed to produce continuous high-quality output. Occasionally, however, you may notice a deterioration in the print quality: part of a character will be missing, or dots will be missing in the black or color print. The following example shows how one type of printing deficiency would appear.

```
Occasionally, air bubbles or paper dust
can clog the nozzles on the print
cartridges.  When this occurs, you might
notice that dots are missing from your
output, or that part of a character is
missing.  The text might appear similar
to the text you are reading now.  This
problem can be easily fixed by priming
and wiping ...
```

Two actions are usually involved in correcting a print quality problem: *priming* and *wiping*. The priming and wiping procedures described in the following troubleshooting section are *identical* to the procedures in Chapter 1 (for installing the print cartridges) and the procedures on the printer's Help Card.

In some cases a third action, *brushing*, is also required. It is important that you perform the procedures in the manner and sequence described.

Priming. Sometimes, a tiny air bubble will clog one or more nozzles on the cartridge's nozzle plate. When you prime a cartridge, you are forcing ink through the nozzles and eliminating the air bubble. Refer to the figure on the following page.



Prime only when loading a new cartridge or when instructed to do so during a troubleshooting procedure. Priming unnecessarily will waste ink.

Wiping. The simple act of sweeping the cartridge firmly across the wiping pad is extremely important. Wiping cleans the nozzle plate and helps to keep ink from building up on the metal connectors in the carriage. Wipe in a single motion, from left to right.

Wiping the cartridge also removes minute paper dust particles from the nozzle plate. Paper dust accumulates gradually over time, and can clog the nozzles just as an air bubble can. *Using recommended PaintJet paper will minimize paper-dust clogging, as well as improve the quality of your output.*

Do not wipe a cartridge with tissues, paper towels, or any fibrous materials, since the fibers can clog the nozzles.

Brushing. Use the brush *only* after priming and wiping twice have failed to restore print quality. The step-by-step troubleshooting sequence (priming, wiping, and brushing) is presented in the following section.

Troubleshooting the Print Cartridges

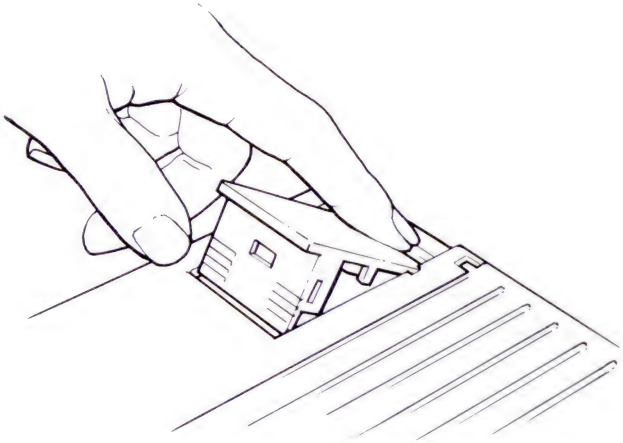
If you have not already done so, please read the previous section, *Important Information about the Print Cartridges*, before performing these troubleshooting steps.

NOTE: If you were directed to this chapter from step 6 on the printer's Help Card (and have already primed and wiped a cartridge twice), go directly to step 6 on page 3-8. ■

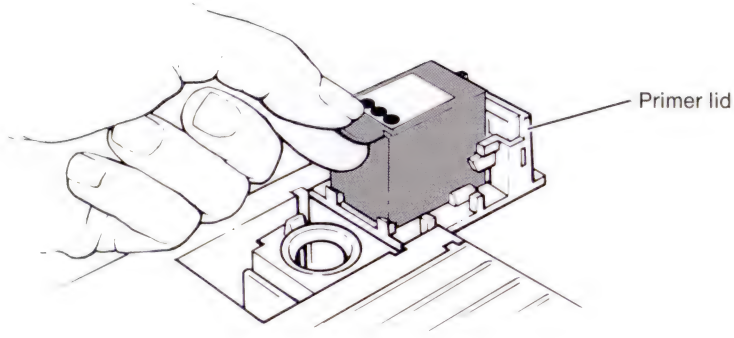
1. **Prime.**

   a. Remove the problem cartridge from the printer. Remove the black cartridge if the problem is with black print, or the color cartridge if the problem is with color print.

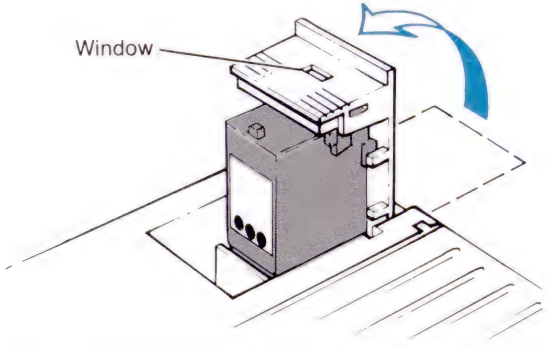
   b. Open the primer lid on the left rear corner of the printer.



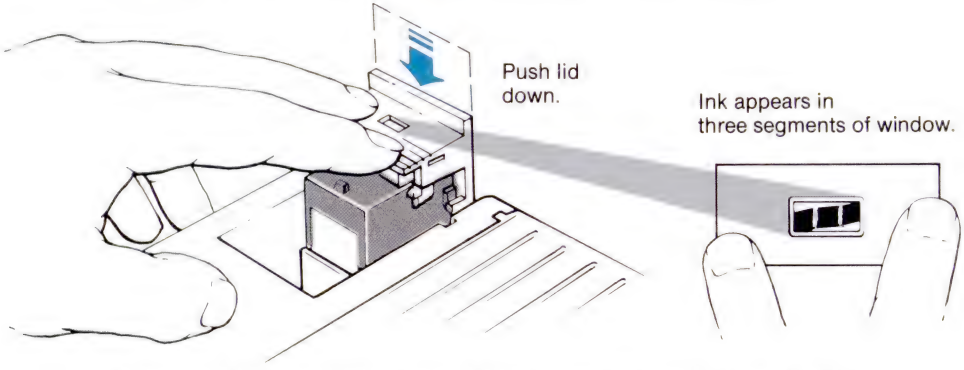
   c. Insert the print cartridge into the primer's lid. The cartridge should fit snugly into place and lie flat. Refer to the figure on the following page.



d. Raise the lid to an upright postion. On the top of the lid you will see a plastic window with three segments.



e. Press the lid straight down until it stops (a distance of about one inch). Hold it down until you see that ink appears in the window (no more than three seconds!), then release.

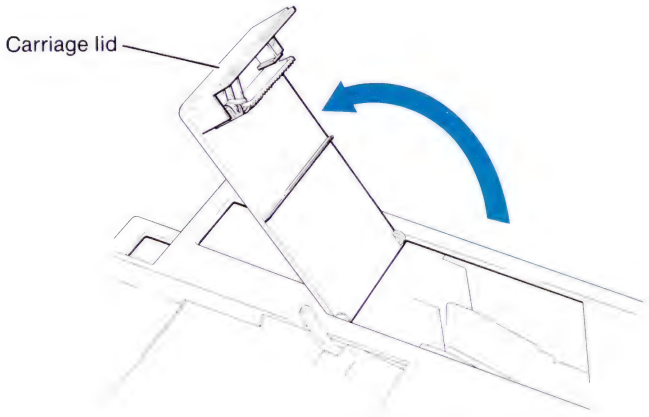


f. Remove the cartridge from the primer lid and close the lid.

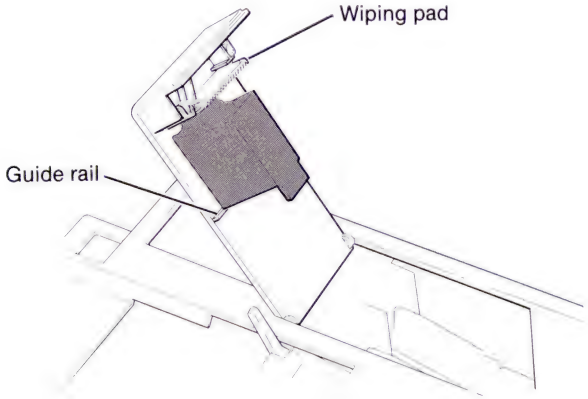
2. Wipe.

NOTE: Do *not* wipe a cartridge with tissues, paper towels, or any fibrous materials, since the fibers can clog the nozzles. ■

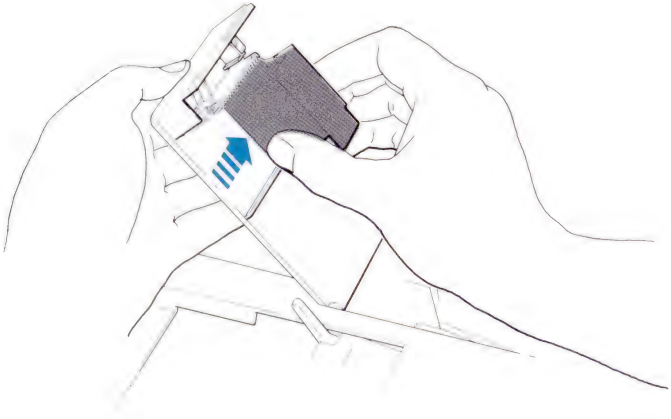
a. Open the carriage lid on the front right corner of the printer.



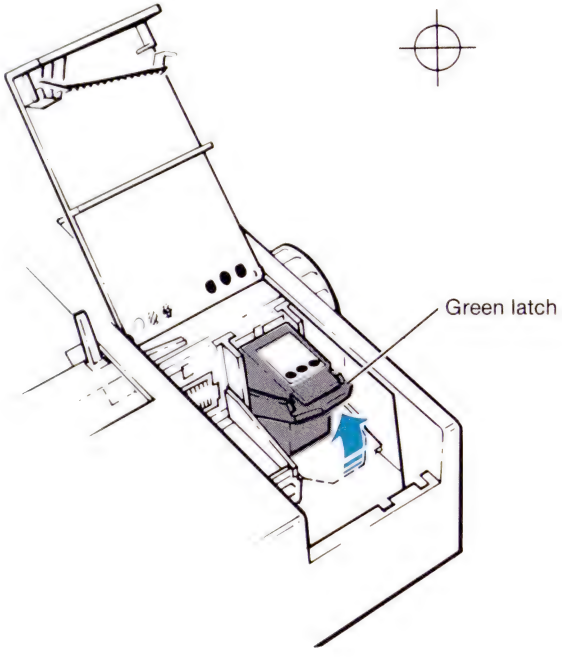
b. Wedge the cartridge between the wiping pad and guide rail. The bottom of the cartridge **must lie flat against the lid**.



c. Support the lid with one hand. With a **brisk** left-to-right stroke, slide the gold nozzle plate across the pad. The nozzle plate should now appear clean; if not, wipe again.



3. **Load.** Put the cartridge back into the carriage. Raise the green latch until it snaps into place.



4. **Run self test.** To see if normal print quality has been restored, run the self test. (With the printer OFF, hold down the **FF** button while pressing and releasing the **ON/OFF** button.

   Compare your output to Examples A, B, and C on the opposite page. Does the output resemble Example A (solid bands of ink and 10 nozzles printing in each row)?

   Yes — You have fixed the problem.

   No — Output is still unacceptable. Go to step 5.

5. **Repeat steps 1, 2, 3, and 4.** (Prime and wipe the cartridge a second time. Then run the self test.)

6. Compare output from the self test to Examples A, B, and C on the opposite page to determine your next step. The following list summarizes your options.

Results of Output . . .	Your Next Step
If output resembles **Example A** . . .	Problem fixed. Resume printing.
If output resembles **Example B** . . . (Individual nozzles are not printing.)	Go to step 7. Brush the metal connectors in the rear of the carriage.
If output resembles **Example C1 or C2** . . . (An entire nozzle row is not printing; the bands of ink are streaking.)	The cartridge is out of ink. Prime and wipe a new cartridge and resume printing.

Example A

Normal print quality.
10 lines (one for each nozzle)
printing in each row.

Example B

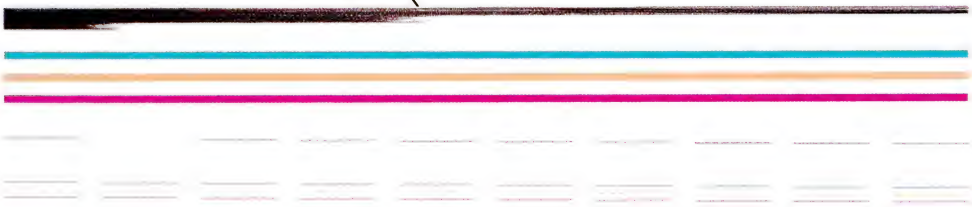
Brushing required.
Go to step 7.

Lines missing.

Example C1

Black cartridge
out of ink.

Replace with a
new black cartridge.



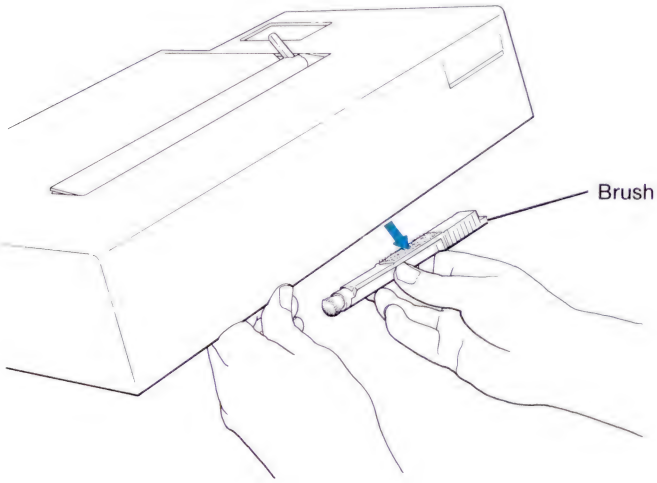
Example C2

Color cartridge
out of magenta ink.

Replace with a
new color cartridge.

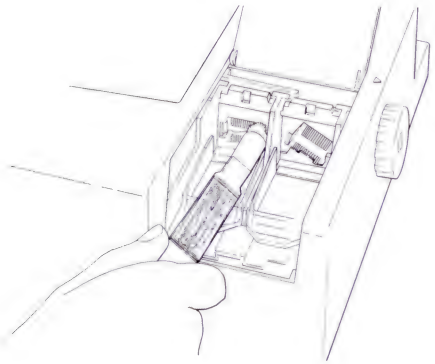
7. **Brush**. Remove the problem cartridge from the printer.

   a. Remove the brush from underneath the front of the printer.

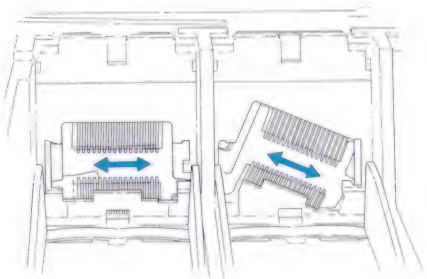


   b. Rinse the brush with *clean* water. Shake off any excess water. (The solvent action of the water is necessary to remove any encrusted ink from the connectors. There is no shock hazard.)

   c. Hold the brush as shown below. With a side-to-side motion, *gently* brush the tips of the suspect metal connectors 5 times in each direction.



Brush connectors gently with side-to-side motion.



8. Run the self test again. Does the output resemble Example A?

   Yes — You have fixed the problem.

   No — Brush the metal connectors a second time.

9. If print quality is unsatisfactory after brushing the connectors a second time, prime, wipe ,and load a new print cartridge.

   If your output with a new cartridge is still deficient, return the printer for service.

Out of Ink?

Here are two indications that a cartridge might be out of ink.

- Solid area fill has ink that streaks or fades out completely.
- Frothy, or foam-like, bubbles appear continuously in the window when you repeatedly prime a cartridge.

It is not possible to determine the exact life of a cartridge because the amount of ink used will vary with each application. Following are page-count estimates for different types of applications.

- black text (1000 characters per page) — 1100 pages
- color graphics with moderate (10–15%) solid area fill — 180 pages
- color graphics with solid background in one color — 50 pages

Remember that these figures are only guidelines. When printing graphics, the number of pages imaged per cartridge is highly dependent on image density and the colors chosen. To extend the life of the cartridge, try to minimize repeated use of the same color for solid area fill (backgrounds and filled objects).

Printer Operation Problems

The following information is provided to help you solve operational problems with your printer. Once you have located your problem in this list, go through the steps in order until the printer is operational. If you determine that the printer needs to be repaired, refer to *Returning Your Printer for Service* at the end of this chapter.

Printer Does Not Turn On

1. Make sure that the power cord on the power module is plugged into a *working* outlet.
2. Make sure that the small connector on the power module is firmly placed in the printer's power socket.

Carriage Moves But Printer Does Not Print

1. Make sure that print cartridges are loaded correctly.
2. Make sure the green latches are UP. (See page 3-7.)

Carriage Motion Ceases and Attention Light Blinks

1. Be sure the paper bail is against the roller.
2. Remove any object that could be blocking the path of the carriage.
3. Press **ON/OFF** to turn power off and return the carriage to far right position. Press **ON/OFF** again to turn power on. (If the problem causing the carriage to stop has not been fixed, the carriage may stop again before reaching the far right position. In this case the attention light will blink and the green power light will go out.)

   If the attention light continues blinking and you cannot restore normal operation, return the printer for repair. See *Returning Your Printer for Service.*

Attention Light On Continuously

1. The printer is out of paper. Load paper into the printer. The attention light should begin *blinking*.
2. Press the SET TOF button; the attention light will go off.

Self Test Doesn't Work

1. Make sure that the power module is plugged in and the print cartridges are loaded correctly. (See page 3-7.)
2. Disconnect the printer from the computer. While holding down the FF button, press and release the ON/OFF button. Be sure to release the ON/OFF button *before* releasing the FF button.

   If the printer does not print out the self test, return the printer for service. See *Returning Your Printer for Service.*

Green Power Light Goes On and Off

If the power cycles on and off and the printer goes off, return the printer for service. See *Returning Your Printer for Service.*

Paper Jam

1. Check alignment and position of the paper stack.
2. Make sure the paper path is clear of cables or other obstructions.
3. Make sure the paper is not wrinkled.
4. Check that paper is not feeding back into the rear of the printer.
5. Verify that the right sprocket is properly adjusted for the width of the paper. (See pages 1-24–1-28.)
6. Check to see if any small pieces of paper are caught in the sprockets or in the paper path. To remove any pieces, fold two sheets (for double thickness) of Z-fold paper and feed them—folded end first—through the printer. Any paper jammed in the printer should come out.

Printer/Computer Communication Problems

1. Make sure that the green power light is on and the attention light is off. If this is not the case, refer to *Printer Operation Problems* beginning on page 3-12.
2. Disconnect the printer from the computer and run the self test to make sure the printer is operational. While holding down the **FF** button, press and release the **ON/OFF** button. (Be sure to release the **ON/OFF** button *before* releasing the **FF** button.)

   If the self test doesn't run and the attention light blinks, return the printer for repair. See *Returning Your Printer for Service.*
3. Connect the printer to your computer system according to the instructions in Chapter 2, or according to your computer's documentation. Make sure that you are using the correct interface cable and that it is connected securely to both the printer and computer. Check the baud rate (RS-232-C), the address switches (HP-IB), and the computer port used for the interface.

4. If problems persist, have the interface cable checked to see if it is defective. If your computer has an interface card, you should also have it checked.

Software Problems

Before proceeding through the following checklist, be sure your printer and computer are communicating successfully. If necessary, run an interconnection test described in Chapter 2. If the program does not work, follow the instructions in the preceding section, *Printer/Computer Communication Problems*.

1. Verify that the software works with both your computer and the printer. Does the software documentation indicate that it will work with your computer? Does the software documentation list the PaintJet, or HP 3630, printer? Is this printer available as a menu selection?

2. Verify that the printer's interface settings on HP-IB or RS-232-C match the requirements of the software package. If the software recommends specific settings, use them.

   If the problem persists, contact the software vendor or manufacturer.

Print Quality Problems

Paper dust or air bubbles are probably clogging nozzles in a print cartridge. Begin troubleshooting by priming and wiping one or both print cartridges. Refer to *Troubleshooting the Print Cartridges* in this chapter.

Print quality will vary with the type of paper you are using. For the best print quality, use HP PaintJet paper, which has been specially coated to complement the ink in the PaintJet print cartridges. With this paper, you will also obtain maximum print cartridge reliability.

Returning Your Printer for Service

If your printer requires servicing, contact the Hewlett-Packard Dealer or HP Sales and Support Office where you purchased the printer for complete service information.

If you need to ship your printer, be sure it is packed in a protective carton. We recommend that you save the original shipping container for this purpose. In-transit damage is not covered by the warranty, so it is best to always insure shipments.

You can help assure effective servicing of your printer by following these guidelines:

1. Follow the troubleshooting instructions in this chapter to make certain the malfunction is in your printer and not the result of configuration problems or a malfunction in your computer or software. If possible, identify the defective function.

2. If you determine that repair is required, please include the following items when returning the printer.

   a. The power module.

   b. A description of the exact configuration at the time of the malfunction, including the interface cable, computer and peripherals, and software (program) in use.

   c. A brief description of symptoms for service personnel.

   d. The serial number of the printer (located on the bottom panel.)

   e. If purchased through an HP dealer, a copy of the sales slip or other proof of purchase to establish the warranty coverage period.

   f. Your name, address, and a phone number where you may be reached during the day.

4

Using Print Features

You probably are running the printer with a software package that enables you to use print features such as color, bold text, and underlining. In this case, the first three chapters should provide you with most of the information you need to successfully run the printer.

You will only need to read this chapter if you wish to access these print features yourself without using software, or wish to configure the printer driver in the software you are using. Some software packages require you to use setup strings that change the printer's settings. You do this by using control codes and escape sequences.

Introduction to Control Codes and Escape Sequences

Control codes are ASCII* characters, such as **CR** (carriage return) and **LF** (line feed), that tell the printer to perform a certain function. Under normal operation, the code itself is not printed.

Escape sequences also control printer functions. An escape sequence consists of the escape character, **ESC**, followed by characters which define the printer function. Escape sequences can be part of a computer

*American Standard Code for Information Interchange

program, or can be used with a software package in a setup string. The following example shows how an escape sequence appears in this manual.

ESC & d D tells the printer to underline

ESC & d @ tells the printer to stop underlining

NOTE: Be sure to observe uppercase and lowercase differences when entering escape sequences. **ESC & d @** and **ESC & D @** are different! **ESC & d @** will work; **ESC & D @** will not.

Also, be sure not to confuse the letter **O** with the number **0**, or the lowercase letter ***l*** with the number **1**. ■

Once you use an escape sequence to invoke a certain print function, the printer will *continue to perform that function until you send another escape sequence to discontinue the function—or until you turn the printer off.*

Using the Keyboard

To generate these print features without software, you will need to know the computer keys used to send escape sequences and control codes to the printer. Following are keys found on many computer keyboards.

Function	Key
control	**Ctrl** or **CNTL**
escape	**ESC**

Usually, you hold down the **Ctrl** key while pressing another key to generate a control code. On some keyboards you can generate **ESC** by holding down **Ctrl** and pressing **[**.

Depending on your computer and your application, you can use these keys to generate escape sequences and control characters within a short program. Or, you might be able to simply key in the command on the screen before sending data to the printer.

Using Setup Strings with a Software Package

Many software packages allow you to send setup strings (escape sequences) to a printer. *Refer to your software documentation to see how this is done.* Some packages require that you specify each control code by its ASCII decimal or hexadecimal number, often preceded by a special character such as \. For example:

ESC & k 4 S could be specified as \ 27 & k 4 S

Or, some software packages require that you specify ESC and *all characters* following it by their ASCII numbers. For example:

ESC & k 4 S is represented in ASCII as 27 38 107 52 83

Appendix A contains the ASCII decimal and hexadecimal representation of all escape sequences used in setting print features. Character set tables in Appendix B contain the ASCII representation of individual control codes and print characters.

Using the CHR$(#) Function in a BASIC Program

Another way to transmit control codes and escape sequences is to use a function in your programming language that converts an ASCII code to a character. In BASIC this function is CHR$(#). In this case, # symbolizes a decimal number that represents an ASCII control code or print character. Following are two examples.

Function	ASCII Decimal Number	CHR$ Representation
escape	27	CHR$(27)
line feed	10	CHR$(10)

Below is an example of an escape sequence in a typical BASIC program line. The escape sequence **ESC & k 2 S** activates compressed print of 18 characters per inch.

```
10 LPRINT CHR$(27)+"&k2S Compressed print is small."
```

Output

```
Compressed print is small.
```

Note that only **& k 2 S** is placed within quotation marks. The CHR$(#) function is *always placed outside* quotation marks.

Following is a short BASIC program. It shows you how to turn print features on and off by using escape sequences as part of the program.

```
10 REM BASIC program example
20 LPRINT CHR$(27)+"&l8DYou can change line spacing."
30 LPRINT "Notice that these three lines are"
40 LPRINT "printed at 8 lines per inch."
50 LPRINT
60 LPRINT CHR$(27)+"&l6DYou can "+CHR$(27)+"(s1B";
70 LPRINT "turn on boldface"+CHR$(27)+"(s0B"
80 LPRINT CHR$(27)+"&dDor underline words."+CHR$(27)+"&d@"
90 LPRINT "You can even "+CHR$(27)+"&k2S";
100 LPRINT "change the print pitch."+CHR$(27)+"&k0S"
110 END
```

Output

```
You can change line spacing.
Notice that these three lines are
printed at 8 lines per inch.

You can turn on boldface
or underline words.
You can even change the print pitch.
```

If your version of BASIC does not include the CHR$(#) function, refer to your BASIC manual for the way to transmit control codes.

Print Pitches and Fonts

The printer offers three print pitches—10, 12, and 18 characters per inch (cpi)—in one of two fonts.

At the default pitch of 10 cpi, the printer uses the Courier font. At 12 and 18 cpi, the printer uses the Letter Gothic font.

ESCAPE SEQUENCE: ESC & k # S

The following table shows the font and pitch for the value field #.

Escape Sequence	Font	Characters Per Inch	Characters Per Line
ESC & k 0 S (default)	Courier	10	80
ESC & k 3 S	Courier	10	80
ESC & k 4 S	Letter Gothic	12	96
ESC & k 2 S	Letter Gothic	18	144

Example

ESC&k0S 10 characters per inch—Courier
ESC&k4S 12 characters per inch—Letter Gothic
ESC&k2S 18 characters per inch—Letter Gothic

Output

```
10 characters per inch --- Courier

12 characters per inch --- Letter Gothic

18 characters per inch --- Letter Gothic
```

Underlining

You can use an escape sequence to control text underlining. All text will be underlined until you send an instruction that turns off underlining, or until you turn the printer off.

ESCAPE SEQUENCE: **ESC&dD** turns on underline mode
ESC&d@ turns off underline mode

Example

ESC&dD You can underline entire blocks of text. **ESC&d@**
You can underline a **ESC&dD**single **ESC&d@**word.

Output

```
You can underline entire blocks of text.

You can underline a single word.
```

Bold

After you send an escape sequence to print in bold text, all text will be printed in bold stroke weight.

ESCAPE SEQUENCES: **ESC(s#B** designates stroke weight for the primary symbol set

ESC)s#B designates stroke weight for the secondary symbol set

where # equals 0 (normal) or 1 (bold)

The following table shows the default stroke weights for the primary and secondary symbol sets.

Stroke Weight	Primary Symbol Set	Secondary Symbol Set
normal	**ESC(s0B** (default)	**ESC)s0B**
bold	**ESC(s1B**	**ESC)s1B** (default)

ESC(s#B defines stroke weight for the power-up symbol set, or the set that you designate as the primary symbol set.

Note that the secondary symbol set defaults to the bold stroke weight. Therefore, you can also invoke bold by "shifting out" (sent by **CTRL N** on many computers) to the secondary set.

For a more detailed discussion of primary and secondary symbol sets, refer to *Primary and Secondary Symbol Sets* in this chapter.

Example

Use bold print to ESC(s1Bhighlight ESC(s0Bwords.
ESC(s1BUse bold print to emphasize a block of text. ESC(s0B

Use bold print to CTRL Nhighlight CTRL Owords.
CTRL NUse bold print to emphasize a block of text. CTRL O

Output

```
Use bold print to highlight words.

Use bold print to emphasize a block of text.
```

Page Formatting

The following table lists the default specifications for the printer's page format.

	English Paper	Metric Paper
Lines per inch	6 lpi	6 lpi
Characters per inch	10 cpi	10 cpi
Characters per line	80	80
Side text margins (Z-fold)	¼ in.	5 mm
Page length	66 lines	72 lines
Text length	60 lines	66 lines

The following sections will show you how to create a page format by changing the line spacing, text length, and page length.

Line Spacing

You can choose among three different line spacings on the printer—9 lines per inch, 8 lines per inch, or the default of 6 lines per inch.

ESCAPE SEQUENCE: ESC & l # D

where # equals the number of lines per inch (lpi)

The following table shows the values for #.

Escape Sequence	lpi
ESC & l 6 D (default)	6
ESC & l 8 D	8
ESC & l 9 D	9

A spacing of 9 lpi looks best when used with a compressed pitch of 18 characters per inch.

If line spacing is changed, the text length and page length *measured in inches remain the same*. For example, when line spacing is 6 lpi and page length is 66 lines (11 inches), changing line spacing to 8 lpi changes the page length to 88 lines (11 inches).

Example

ESC & l 6 D This sentence is printed at
the default spacing of
6 lines per inch.

ESC & l 8 D These sentences are printed
at 8 lines per inch. You can see
that the lines are closer together.

Output

```
This sentence is printed at
the default spacing of
6 lines per inch.

These sentences are printed
at 8 lines per inch. You can see
that the lines are closer together.
```

Perforation Skip

Use the perforation skip mode to prevent text from being printed on the perforation of Z-fold paper. In this mode, the printer sets top and bottom margins and automatically skips over the perforations instead of printing on them.

ESCAPE SEQUENCES: **ESC & l 1 L** turns on perforation skip
ESC & l 0 L turns off perforation skip (default)

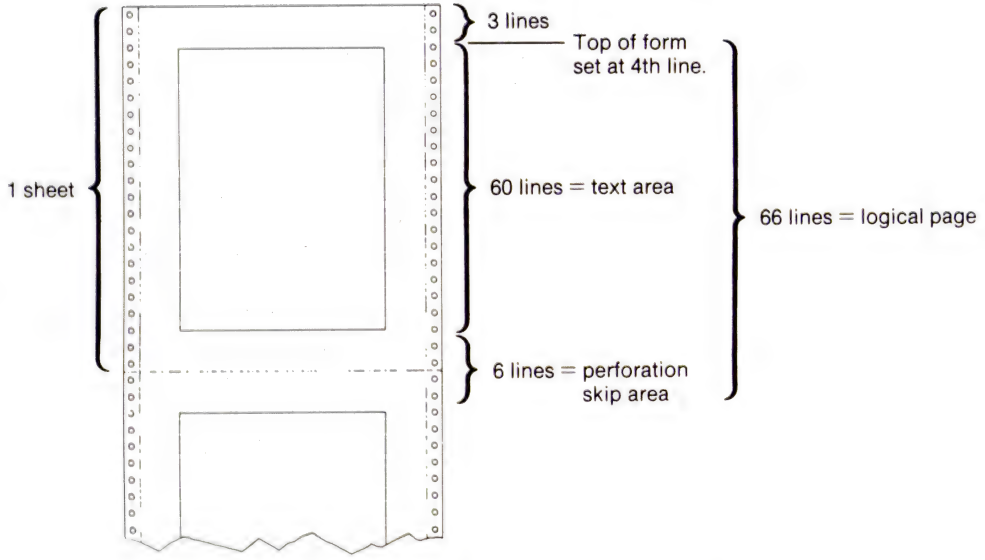
When you turn the printer on, the page length is automatically set to 66 lines (72 lines for metric paper) and text length to 60 lines (66 lines for metric paper). The 6 lines that are not part of the "text area" make up the top and bottom margins of 3 lines each—known as the "perforation skip area". The text area and the perforation skip area together form a *logical page*.

When you set top of form to the fourth line on the page, the printer—with perforation skip invoked—will leave a margin of 3 lines at the top and bottom of each page. You can see this format in the figures on the next page.

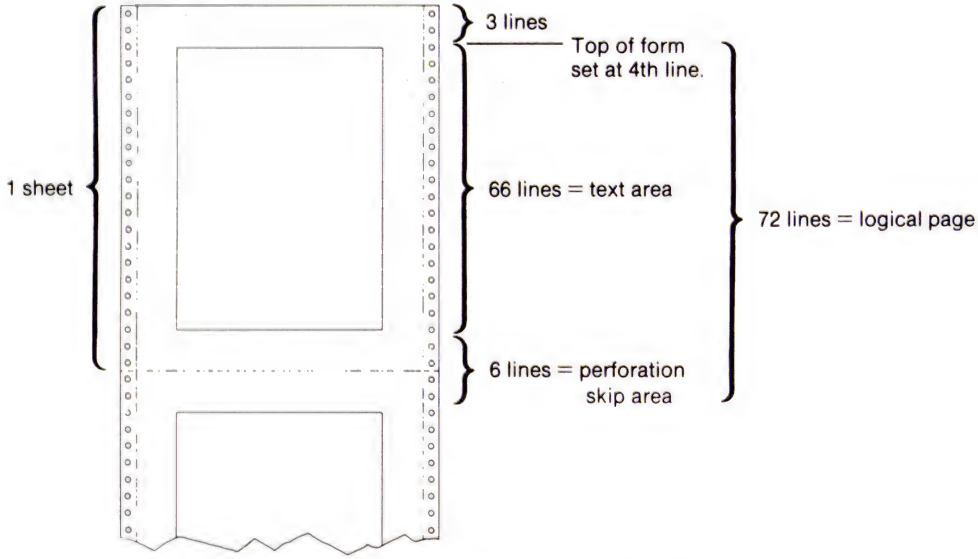
You do not specify perforation skip length directly. When perforation skip is enabled with **ESC & l 1 L**, the printer will set perforation skip length as the difference between the page length and text length. Or, using default values,

	page length	−	text length	=	perforation skip
English	66	−	60	=	6
metric	72	−	66	=	6

See the following sections for more information on setting page length and text length.



Perforation Skip Area with Default Page and Text Length—English Paper



Perforation Skip Area with Default Page and Text Length—Metric Paper

Setting Your Own Perforation Skip Area

If you want to use the perforation skip mode with a text and margin area that is different from the default settings, you must change the text length, the number of lines printed on each page.

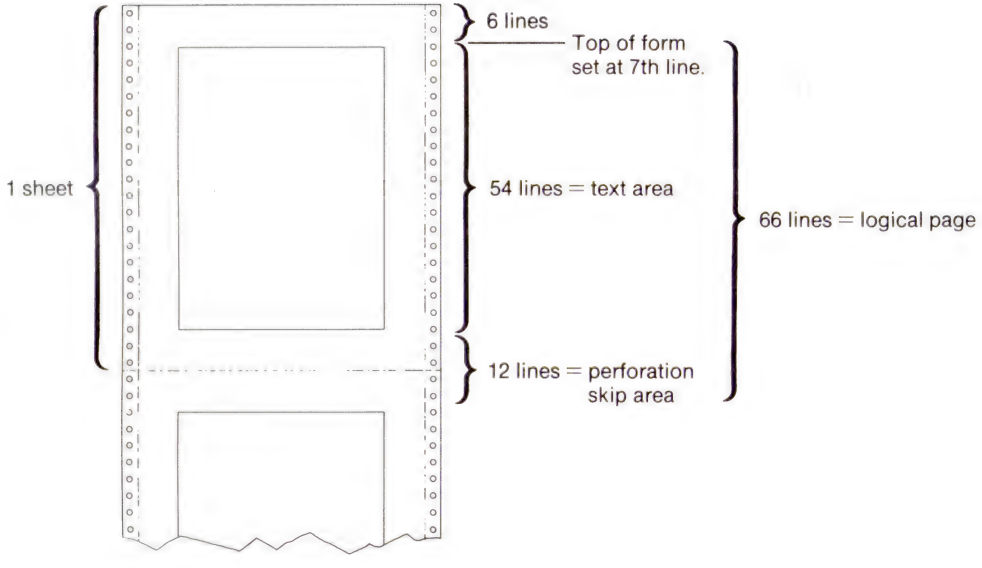
Suppose, for example, that you want top and bottom margins of one inch each, instead of the default half-inch margins. At the *default* line spacing of 6 lines per inch, the total perforation skip area for top and bottom margins would comprise 12 lines.

top margin	+	bottom margin	=	perforation skip
6 lines	+	6 lines	=	12 lines

You would then need to determine the text length, since perforation skip area is the difference between page length and text length. Or, expressed differently:

page length	−	text length	=	perforation skip
		or		
page length	−	perforation skip	=	text length
66 lines	−	12 lines	=	54 lines

You would then send the escape sequence **ESC & l 54 F** to set a text length of 54 lines. Since the top and bottom margins are 6 lines each, you would set top of form to the seventh line of the page. The page format would appear as in the figure on the next page.



User-Defined Perforation Skip Area—
English Paper

A review of the procedure to set the perforation skip follows. The values used are those from the previous example.

1. Determine the top and bottom margin area in terms of the set line spacing. In this example, the total margin area, or perforation skip area, is 12 lines.

2. Subtract the perforation skip area (12 lines) from the page length (66 lines) to determine the text length (54 lines). Set your text length using **ESC & *l* # F**—in this case **ESC & *l* 54 F**.

3. Divide the perforation skip area (12 lines) by two to determine the length of the margins (6 lines). Set top of form to the first line of text (seventh line).

4. Enable perforation skip using **ESC & *l* 1 L**.

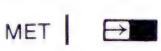
Page Length

The page length determines the difference between top of form on one page and the next.

ESCAPE SEQUENCE: ESC & l # P

where # is the number of lines per page

The default page length depends on the setting of the **MET/ENG** switch on the printer's rear panel. At the default line spacing of six lines per inch, page length is established as follows.



When set to **ENG**, page length defaults to 11 in. (279.4 mm), or 66 lines.

When set to **MET**, page length defaults to 12 in. (304.8 mm), or 72 lines.

The value field # for the page length can be from 1 to 255 lines. Values outside of this range are ignored except for 0 (zero), which restores the power-up setting of 66 lines at 6 lines per inch.

When perforation skip mode is on, the page length value is used to determine the length of the skip area that includes the top and bottom margins. Refer to the figures on page 4-11.

NOTE: The page length escape sequence automatically sets the text length to *one inch less* (6 lines at 6 lines per inch, 8 lines at 8 lines per inch, etc.) than the new page length. ■

Text Length

Text length is the number of printed lines on a page.

ESCAPE SEQUENCE: ESC & l # F

where # is the specified number of text lines

The default text length is one inch less than the page length. The first line in the text area is the same line as the first line of the logical page. At 6 lines per inch, default text length is 60 lines on English paper and 66 lines on metric paper. Refer to the figures on page 4-11.

The value field # for the text length can be from 1 to 255 lines. Values outside of this range are ignored except for 0 (zero), in which case text length defaults to one inch less than the page length. Since text length cannot exceed page length, a specified text length that is greater than a previously specified page length will be ignored.

Note that any time you change the page length, the text length is automatically changed to *one inch less* (6 lines at 6 lines per inch, 8 lines at 8 lines per inch, etc.) than the page length.

Cursor Positioning

The position at which the next character will be printed is called the *current active position*. For graphics mode, it is the position where the next raster dot row will be printed. You can move this current active position so that printing will begin anywhere you want on a page.

ESCAPE SEQUENCES: **ESC & a # H** positions cursor horizontally

ESC & a # V positions cursor vertically

where # is an integer that represents decipoints

The table below lists the range of decipoint values (#) that result in an on-paper move. The values are based on the *text area* of a logical page.

Text Area	Width	Height
English Z-fold 8 × 11 in.	0 to ±5759	0 to ±7919
Metric Z-fold 203 × 304.8 mm	0 to ±5759	0 to ±8639

If no such position exists on a logical page, the cursor moves to the appropriate limit. Refer to the tables and explanations on the next page.

NOTE: Since the printer's resolution is 180 dpi rather than 720 dpi, the decipoint position is truncated at the nearest dot position. However, the printer keeps track of all positions in decipoint units to avoid cumulative rounding errors. To calculate the nearest dot position, divide the number of decipoints by four. ■

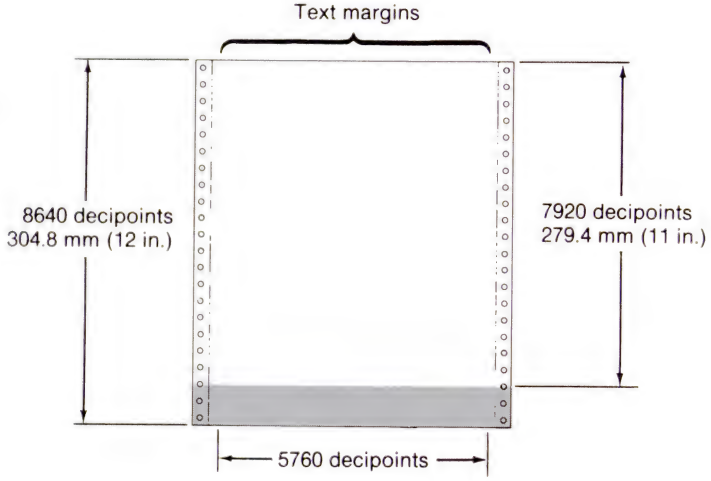
Listed below are the relationships between decipoints and dimensions of English and metric paper.

English paper:

1 decipoint	= 1/720 inch
1 inch	= 720 decipoints
8 inches	= 5760 decipoints (range 0 to ±5759)
11 inches	= 7920 decipoints (range 0 to ±7919)

metric paper:

203 mm	= 5760 decipoints (range 0 to ±5759)
304.8 mm (12 in.)	= 8640 decipoints (range 0 to ±8639)



The following tables indicate how cursor movement is affected by a sign (or no sign) preceding the value field.

Sign	Horizontal Cursor Movement
plus sign	relative distance to the right of current active position
minus sign	relative distance to the left of current active position
no sign	absolute distance from left text boundary

If the requested location is to the left of the left text boundary, printing will begin at the left text boundary.

If the requested location is beyond the right text boundary, printing will begin at the left text boundary on the next line due to the text wrap-around function. In the case of printing graphics, however, the requested position is off the page and no printing will occur.

Sign	Vertical Cursor Movement
plus sign	relative distance below the current active position
minus sign	relative distance above the current active position
no sign	absolute distance from the current top of form (TOF)

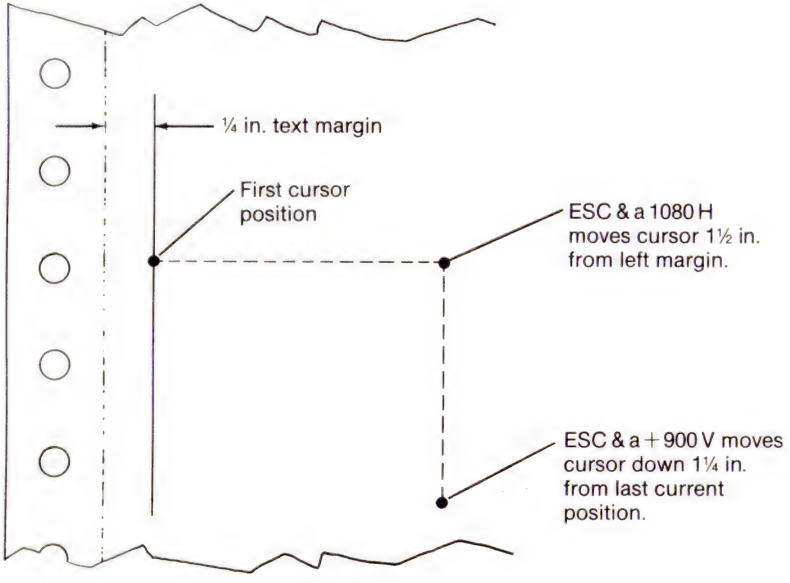
Positive paper motion is always *truncated at the bottom of the logical page*, even if the requested location is beyond the logical page boundary.

Similarly, negative paper motion is *always truncated at the top of the logical page*. On cut sheet paper, negative paper motion should be avoided when printing within one inch of the paper's bottom edge. Negative motion could cause the paper to slip, which in turn could affect print quality.

NOTE: When using these escape sequences, it is necessary to suppress all automatic carriage returns and certain line feeds. Otherwise, the automatic carriage return at the end of a computer program line would always reset the current active horizontal position to the left text boundary; line feeds would affect relative vertical positions.

When using Microsoft® BASIC, suppress carriage returns by putting a semicolon at the end of each LPRINT statement. If necessary, use the BASIC statement `WIDTH LPRINT 255` on the HP Touchscreen; on the HP Vectra or IBM PC, use `WIDTH "LPT1:",255`. ■

The following figure shows absolute and relative cursor movement.



Using Control Codes to Position Print on a Page

The *current active position* is the position at which the next character will be printed. Normally, the current active position moves one character to the right each time the printer receives a printing character. You can use the control codes presented below (or the escape sequences described in the previous section) to change the current active position on the page.

Carriage Return — Moves the current active position to the left print margin on the current line. A carriage return also causes the current line to be printed. Carriage returns are normally inserted by the computer's operating system or software.*

Line Feed — Moves the current active position to the same character position on the next line. This causes printing of the current line. Normally, these are handled automatically by your computer system.*

Backspace — Moves the current active position one character to the left.

Form Feed — Advances the paper to the top of the next form (the same function as pressing the **FF** button).

Half Line Feed — Performs like a line feed, except that the paper advances *one-half* the distance of the current line spacing. Half line feed is useful for printing subscripts and, when combined with backspacing, for superscripts.

On some computer keyboards, you can send control codes to the printer in the following manner:

	Hold down...	and press	
backspace	CTRL	H	
line feed	CTRL	J	
form feed	CTRL	L	
carriage return	CTRL	M	
half line feed	CTRL	[	and then press =

*The automatic line termination escape sequence, presented on page 4–31, can be used to specify which one of several combinations of line feeds and carriage returns is to be used by the printer.

Color Text

Seven colors are available for printing text—black, red, green, blue, cyan, magenta, and yellow. You can also inhibit printing altogether, so that only the "color" of the paper (usually white) appears in an area.

ESCAPE SEQUENCE: ESC&v#S

The following table shows the values for # and the corresponding color.

Escape Sequence	Color
ESC&v0S (default)	black
ESC&v1S	red
ESC&v2S	green
ESC&v3S	yellow
ESC&v4S	blue
ESC&v5S	magenta
ESC&v6S	cyan
ESC&v7S	white

Following are three examples, each one followed by the output it generates.

Example

Today is a ESC&v1Sred letter ESC&v0Sday!

Output

```
Today is a red letter day!
```

BASIC Example

```
10 FOR X = 0 TO 7
20  LPRINT CHR$(27)+"&v";X;"S";
30  LPRINT "This is the color palette for text."
40 NEXT X
50 END
```

Output

```
This is the color palette for text.
This is the color palette for text.
This is the color palette for text.
This is the color palette for text.
This is the color palette for text.
This is the color palette for text.
This is the color palette for text.
```

BASIC Example

```
10 A$=CHR$(27)+"&v5S"
20 B$=CHR$(27)+"&v1S"
30 C$=CHR$(27)+"&v4S"
40 D$=CHR$(27)+"&v2S"
50 LPRINT A$+"You can"+C$+" print different";
60 LPRINT D$+" colors on"+B$+" one line."
70 END
```

Output

```
You can print different colors on one line.
```

Primary and Secondary Symbol Sets

You can use an escape sequence to access any of the symbol sets available on the printer.

ESCAPE SEQUENCES: **ESC(#ID** designates a primary symbol set

ESC)#ID designates a secondary symbol set

For example, to designate German as the primary symbol set, send the following escape sequence:

The following table lists the escape sequences for the printer's symbol sets. Note that the only difference between a primary and secondary set designation is the symbol (and).

Symbol Set	Designate As Primary	Designate As Secondary	ISO Number*
Norwegian 1	ESC(0D	ESC)0D	60
ECMA-94	ESC(0N	ESC)0N	100
United Kingdom	ESC(1E	ESC)1E	4
French	ESC(1F	ESC)1F	69
German	ESC(1G	ESC)1G	21
Italian	ESC(0I	ESC)0I	15
Swedish Names	ESC(0S	ESC)0S	11
Spanish	ESC(2S	ESC)2S	17
ASCII (US)	ESC(0U	ESC)0U	6
Roman8	ESC(8U	ESC)8U	—
PC-8	ESC(10U	ESC)10U	—
PC-8 (Danish/Norwegian)	ESC(11U	ESC)11U	—
Downloadable font	ESC(X	ESC)X	—
Printer default set**	ESC(0@	ESC)0@	—

*Official registration number with the International Standards Organization.

**Refer to Appendix A for other options for the value field #.

Depending on the setting of the rear-panel switch, the printer designates one of two symbol sets, PC-8 or Roman8, as the default (primary) set. It also designates that set as the secondary set, only with **bold** stroke weight.

Set Selected As Power-Up Default	Primary Set	Secondary Set
Roman8	Roman8	**Roman8 bold**
PC-8	PC-8	**PC-8 bold**

Because bold stroke weight is a *default attribute* of a secondary set, any set you designate as secondary will automatically be in bold.* If you want to have a secondary set that is normal stroke weight, you can "turn off" bold in the secondary set by using the escape sequence **ESC) s 0 B**. (Refer to *Bold* in this chapter.)

There are two ways to access special symbols in any set.

- Use the BASIC CHR$(#) function (or a similar function in another computer language).
- Send the equivalent ASCII symbol to the printer from the computer keyboard.

In the following example, the Spanish symbol set is selected. The symbols entered from the a typical US keyboard are output as Spanish characters of the same decimal value. Decimal code 93 (] on most US keyboards) is ¿; decimal code 92 (\ on most US keyboards) is Ñ.

*This is true for all sets except the downloaded set. When designated as secondary, a downloaded set will default to the normal stroke weight.

Example

```
ESC(2S ]SU COMPA\IA?
```

Output

```
¿SU COMPAÑIA?
```

Using Shift In and Shift Out

You can use ASCII control codes, shift in and shift out, to alternate between the primary and secondary symbol sets. These are described in the following table.

Control Code	Decimal Code	BASIC	Keyboard*
SO (shift out to secondary set)	14	CHR$(14)	**CTRL N**
SI (shift in to primary set)	15	CHR$(15)	**CTRL O**

*You can send these control codes from *some* computer keyboards by holding down the **CTRL** key and then pressing the **N** or **O** key.

Print Modes

The printer offers three print modes: unidirectional mode, bidirectional mode, and a transparency mode which provides for high ink density when printing on transparency film.

ESCAPE SEQUENCE: ESC & k # W

The following table lists the values for # and the corresponding function.

Escape Sequence	Function
ESC & k 0 W	unidirectional mode*
ESC & k 1 W (default)	bidirectional mode*
ESC & k 3 W	transparency mode

*Selection of unidirectional or bidirectional mode pertains to black text printing only. They do not affect color text or graphics, which are always unidirectional.

Unidirectional Mode — Use this mode when you want the straightest possible alignment of any vertical lines (a spread sheet, for example).

Bidirectional Mode — This is the printer's default mode. It offers high-quality text printing at the fastest available speed.

NOTE: The printer will automatically switch from bidirectional mode to unidirectional mode when printing a line that has vertical lines or certain line-draw characters. Upon completion of this line, the printer will automatically resume printing in bidirectional mode. ■

Transparency Mode — In order to obtain high ink saturation, *always* use this mode when printing on transparency film. It is not recommended for paper.

Display Functions Mode

Under normal operation, control codes and escape sequences are not printed. They instruct the printer to perform a function. The display functions mode allows you to print control codes and escape sequences *without* executing them. In this way you can determine what control codes and escape sequences are being sent to the printer. Appendix B contains a table which lists the symbols for each control code.

ESCAPE SEQUENCES: **ESC Y** turns on display functions mode

ESC Z turns off display functions mode

Note that only one control code and one escape sequence are printed *and executed* in display functions mode.

- carriage return (**CR**), which is printed and then executed as a carriage return and line feed.
- **ESC Z**, which is printed and then executed.

The example below shows normal output first, followed by output after display functions mode is enabled with **ESC Y**.

BASIC Example

```
10 LPRINT  "In DISPLAY FUNCTIONS MODE,"+CHR$(14);
20 LPRINT  " control codes"+CHR$(15)
30 LPRINT  "are "+CHR$(27)+"&dDprinted";
40 LPRINT  CHR$(27)+"&d@, not executed."
50 LPRINT
60 LPRINT  CHR$(27)+"Y"
70 LPRINT  "In DISPLAY FUNCTIONS MODE,";
80 LPRINT  CHR$(14)+ " control codes"+CHR$(15)
90 LPRINT  "are "+CHR$(27)+"&dDprinted";
100 LPRINT  CHR$(27)+"&d@, not executed."
110 LPRINT  CHR$(27)+"Z"
120 END
```

Output

```
In DISPLAY FUNCTIONS MODE, control codes
are printed, not executed.
```

```
In DISPLAY FUNCTIONS MODE, control codes
are &dDprinted&d@, not executed.
Z
```

Transparent Data Transfer

This feature allows the printing of symbols that are "transparent" to normal operations. No control codes are executed, not even **CR** or **ESC Z**.

ESCAPE SEQUENCE: **ESC & p # X**[data]

where **#** is the number of data bytes to follow

NOTE: The brackets shown in the previous sequence are for clarity only. Do not include brackets when sending data bytes to the printer. ■

Transparent data transfer is especially useful with PC-8 symbol sets that have printing symbols in a location reserved for ASCII non-printing control characters (decimal codes 0–31). Under normal operation, symbols with decimal codes 1–6, 16–26, and 28–31 will print, because these codes have no control functions implemented on the printer.

Under normal operation, however, symbols with decimal codes 0, 7–15, or 27, which are the same as a control function implemented on the printer, *will not print*. Instead, the control function will be executed. For this reason, they are called transparent symbols.

For example, with the PC-8 symbol sets, `LPRINT CHR$(12)` would execute in the following way.

normal operation:	would execute a form feed
transparent data transfer:	would print the symbol ♀
display functions mode:	would print the symbol

With transparent data transfer enabled, the printer can print any character or symbol, including the transparent symbols. *No control codes are executed, not even* **CR** or **ESC Z**. All character codes will print either a graphics symbol or a blank space (in the case of an undefined character).

Transparent data transfer is enabled *only for the specific number of bytes indicated in the value field* **#**. These bytes must directly follow the sequence **ESC & p # X**.

See Appendix B for complete ASCII character code tables.

The following table lists the symbols which can only be accessed after sending **ESC & p # X**.

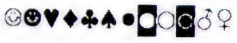
Decimal Code	Control Function Executed	Transparent Symbol Printed When ESC&p#X Executed
7	—	•
8	backspace	◘
9	—	○
10	line feed	◙
11	—	♂
12	form feed	♀
13	carriage return	♪
14	shift out	♫
15	shift in	☼
27	escape	←

The following BASIC program shows the use of transparent data transfer to print graphics symbols with decimal codes 1–12 in the PC-8 set. Note that the value field (#) in the escape sequence is 1, since only one character is printed during each pass through the loop.

BASIC Example

```
10 FOR X = 1 TO 12
20  LPRINT CHR$(27)+"&p1X"+CHR$(X);
30  NEXT X
40 END
```

Output



Automatic Line Termination

Most computers end each line with a carriage return and a line feed. However, some computers end each line with either a carriage return or a line feed, but not both. If you have such a system, you will need to send an escape sequence that causes the printer to end each line with a carriage return or a line feed.

ESCAPE SEQUENCE: ESC & k # G

The following table lists the values for # and the corresponding responses made by the printer.

Automatic Line Termination Escape Sequences		
Escape Sequence	**Character* Received by Printer**	**Character(s)* Executed by Printer**
ESC & k 0 G (default)	CR LF FF	CR LF FF
ESC & k 1 G	CR LF FF	CR,LF LF FF
ESC & k 2 G	CR LF FF	CR CR,LF CR,FF
ESC & k 3 G	CR LF FF	CR,LF CR,LF CR,FF

*CR = carriage return
LF = line feed
FF = form feed

Self Test

You can send an escape sequence to instruct the printer to print a copy of the self test. The printer does not actually perform the RAM/ROM test in this case, but the printout will confirm that RAM/ROM tested OK when the printer was turned on. Refer to *Self Test* in Chapter 1 for a complete description.

ESCAPE SEQUENCE: ESC z

Resetting the Printer

You can send an escape sequence to reset the printer.

ESCAPE SEQUENCE: ESC E

There are two methods for returning your printer to its preset (default) conditions.

1. Simply turn the printer off for a few seconds, then back on. The printer will read the mode-select switches on the rear panel, reset all features to their default values, and set top of form to the current line. Downloaded characters are lost.

2. Send the escape sequence **ESC E**. The printer will print whatever data remains in the output buffer, reset all print features to their default values, and execute a form feed. Downloaded characters are retained. Computer-printer communication is not disrupted.

   The printer will *not* read the mode-select switches on the rear panel. The printer will use the values read when you turned it on.

5

Raster Graphics

The printer implements escape sequences that instruct it to print color graphics images rather than ASCII characters. Most users will have software that generates and sends raster graphics data to the printer. The information in this chapter is therfore intended for those users with special application needs. The detailed explanations for the individual escape sequences are given after presentation of the general concepts.

NOTE: On printers with an RS-232-C interface, do not attempt to print raster graphics with any parity active. Employment of odd, even, or mark (one) parity clears the high bit of all bytes received by the printer. Clearing the high bit prevents the accurate transmission of raster graphics data. ■

Color Raster Graphics Concepts

A raster image is a picture that is created by printing a row/column matrix of *pixels* (picture element dots). These pixels are printed in rows. Each pixel row can be defined with one to four color planes, depending upon the number of pixel colors that are needed.

Each "color plane" is created by a single escape sequence that defines a binary digit for each column position in a pixel row. Since a maximum of four color planes are allowed, each column position in a pixel row may be defined with as many as four bits. The bits specified for each column position define the pixel's color by forming a binary number which is interpreted as one of the printer's *color palette index numbers.*

The printer's *color palette* contains the available colors that the printer can print at any one time. The color palette can contain a maximum of 16 colors, with each color assigned to an index number from 0 to 15. The pixels in each row can therefore be printed using any of the 16 colors currently assigned to the color palette's index numbers. The colors in the color palette are defined using NTSC* standardized RGB (red, green, blue) coordinate values.

The following example shows how values in the range of 0 to 255 can be used in the BASIC CHR$(#) function to generate any combination of bit patterns needed to create a color plane, or in the case of a single color plane, a pixel row dot pattern.

BASIC CHR$(#) Decimal Value	Binary Value	Dot Pattern Printed by One Byte
CHR$(255)	11111111	••••••••
CHR$(60)	00111100	••••
CHR$(24)	00011000	••

*National Television Systems Committee

The pixel data is printed in dot rows starting at the currently specified left graphics margin. Each dot row, or color plane, is sent with a separate escape sequence which tells the printer how many bytes to interpret as binary data rather than ASCII characters. The first data byte sent defines the dot pattern for the first eight dots from the left graphics margin. The second byte sent defines the dot pattern for the next eight dots and so on across the page until either the specified number of bytes have been received or the right graphics margin is reached. Any dots which would extend beyond the right graphics margin are clipped off. If more than the specified number of bytes are received, the excess bytes will be printed as ASCII characters.

The printer can print a raster image up to eight-inches wide (1440 dots). The only limitation to the length of the raster image is the length of the Z-fold paper, because raster graphics is independent of all top and bottom text margins and the perforation skip mode. The printer also allows you to move the left graphics margin and change the picture width. This combination effectively sets both the left and right graphics margins and eliminates the need to send pixel data to account for the white space that surrounds centered raster images.

The printer has the capability of printing raster images at either 180 or 90 dots per inch (dpi) in both the horizontal pixel rows and the vertical pixel columns. *At 180 dpi, each bit sent to the printer causes a pixel (column position) to be represented with one dot. At the default 90 dpi, however, each bit causes a pixel to be represented with four dots.* Since the spacing between dots is always the same, changing the resolution changes the size of the printed raster image. That is, the image printed at 90 dpi is twice as wide and twice as tall as when printed at 180 dpi.

The following figure shows the concept of the dot patterns produced by a single bit at each resolution.

Bit		180 dpi		90 dpi
1	=	•	or	::

Shown next is a full byte representation of the resolution concept.

decimal value: CHR$(255)

binary value: 11111111

180-dpi pattern: ••••••••

90-dpi pattern: ::::::::::::::::

Two factors, discussed in the following sections, determine the number of colors than can be used in any given raster row.

- the number of color planes used to define the raster row
- the currently specified resolution of 90 or 180 dpi

Color Planes

The default for raster data specification is one color plane, where only two index numbers are needed for black and white raster images. To access more colors in the palette, you must either redefine the colors in the single-plane palette or increase the number of color planes.

- one color plane accesses index numbers 0–1 (default).
- two color planes access index numbers 0–3.
- three color planes access index numbers 0–7.
- four color planes access index numbers 0–15.

The following example shows how the bit combinations specified in multiple color planes form a group of bits (displayed vertically here) which are interpreted as color palette index numbers. This example shows all eight bit combinations that are possible when using three color planes. Note that the first plane sent always defines the least significant (top) bit of the binary index number.

Data Planes	Byte Value	Three-Bit Column Combinations							
plane 1*	CHR$(85)	0	1	0	1	0	1	0	1
plane 2	CHR$(51)	0	0	1	1	0	0	1	1
plane 3	CHR$(15)	0	0	0	0	1	1	1	1
palette index number		0	1	2	3	4	5	6	7

*least significant bit

Resolution

At 180 dpi, the printer is capable of printing only eight colors: black, red, green, yellow, blue, magenta, cyan, and white. Note that no ink is deposited when white is specified. Therefore, white is always represented by the color of the paper currently being used.

At default 90 dpi, 330 distinct dot patterns can be generated. *Each of these dot patterns is built by using a specific combination of the eight colors obtainable at 180 dpi to print the four dots that represent a single pixel at the 90-dpi resolution.* This technique is known as "2 × 2 dithering", where the human eye perceives the four-dot patterns as 330 shades of color.

Default Color Palette

The following table shows the default color palettes and the index numbers that can be selected when the number of planes per row is in the range of one to four. Notice that the same basic colors are repeated in a different order for the higher index numbers of the four-plane colors at 180 dpi. This is due to the previously stated 180-dpi color limitations. The order of the colors are changed to approximate, as closely as possible, the colors generated for the same index numbers at 90 dpi.

Palette Index Number	Number of Color Planes				
	1	2	3	4 (180 dpi)	4 (90 dpi)
0	white	black	black	black	black
1	black	red	red	red	red
2	—	green	green	green	green
3	—	white	yellow	yellow	yellow
4	—	—	blue	blue	blue
5	—	—	magenta	magenta	magenta
6	—	—	cyan	cyan	cyan
7	—	—	white	(red)	orange
8	—	—	—	(blue)	purple
9	—	—	—	(black)	brown
10	—	—	—	(green)	dark gray
11	—	—	—	(magenta)	light gray
12	—	—	—	(red)	pink
13	—	—	—	(blue)	light blue
14	—	—	—	(yellow)	light yellow
15	—	—	—	(white)	white

The first chart in the color section at the end of this chapter shows the default palette colors.

You can customize the color palette so that it contains any 16 of the available colors:

1. Send three RGB coordinate values to the printer. Use **ESC * v # A**, **ESC * v # B**, and **ESC * v # C**. (Refer to pages 5–17.)
2. Assign the color an index number (0–15) with **ESC * v # I**. (Refer to page 5–17.)
3. Repeat this process to load up to 16 colors into the color palette.

Color Spectrum

To view the full spectrum of the printer's colors, *hold down* the **LF** button while turning ON the printer (pressing and releasing the **ON/OFF** button). The color spectrum will appear on the *second page of output*, following the printer's demo.

The matrix numbers on the color spectrum are keyed to the table that begins on page 5-24. The table lists the measured NTSC-standardized RGB coordinate values for 330 available shades of color. The default palette colors are identified by the row/column matrix number in a separate table on page 5-30.

The printer has a resident table of RGB values that it compares to the user-specified RGB values. When the printer receives a request for a certain color, it will select the best match to the user-specified color from the colors it can generate. Thus, the same RGB values that are sent to an NTSC-standardized monitor can be sent to the printer, and the resulting hardcopy image will be in the same approximate colors as the image on the monitor.

Raster Graphics Escape Sequences

The escape sequences are explained in an order that allows a simple raster example to be progressively expanded to show the effect each sequence has on the raster image. The raster graphics default conditions shown below remain in effect until they are specifically changed in the tutorial program.

Graphics Function	Default
Resolution	90 dpi*
Left graphics margin	0 (1st printable position)
Picture width	1440 dots*
Number of color planes	1 (black and white)
Transmission mode	0 (unencoded)
X and Y offset	none

*Remember that, at 90 dpi, a pixel is represented by a two-by-two matrix of four dots. Therefore, the maximum number of dots in a row (8-inch picture width) is 1440 (8 [90 × 2] = 1440).

NOTE: Some programming languages periodically insert carriage return and line feed characters into the data, causing blank lines in the graphics pattern. These automatic **CR** and **LF** characters should be disabled. For example, the statement `WIDTH "LPT1:",255` is used with Microsoft® BASIC, version 3.0, on the IBM PC to disable the automatic insertion of **CR** and **LF** characters. The statement `WIDTH LPRINT 255` performs the same function with BASIC on the HP 150. Terminating a program line with a semicolon (;) is also required to disable the **CR** and **LF** characters that are generated at the end of `LPRINT` statements. Consult your computer programming manual for information on disabling the **CR** and **LF** functions with your programming language. ■

The printer enters *raster mode* when it receives either of the following two escape sequences.

ESC * r # A start raster graphics

ESC * b # W transfer raster data by row

The printer can print raster graphics without specifically being in raster mode. Raster mode is a more restricted state where the left graphics margin and the graphics resolution cannot be changed. Once in raster mode, the printer will ignore subsequent start raster graphics, **ESC * r # A**, and raster graphics resolution, **ESC * t # R**, escape sequences until an end raster graphics, **ESC * r # B**, sequence is received. All other raster graphics attributes can be changed at any time.

Start Raster Graphics

The following escape sequence places the printer in raster mode and also specifies the starting position for the graphics image.

ESCAPE SEQUENCE: ESC * r # A

where # = 0 or 1

The value field (#) specifies the mode in which the left graphics margin will be set.

0 sets the margin to the left-most printable position on the page.

1 sets the left graphics margin to the text current active position (as defined by text, **CR**, **LF**, **BS**, etc., or by cursor-positioning sequences **ESC & a # H** and **ESC & a # V**).

When you start printing, the upper-left corner of the raster image will be printed at the specified location.

The text cursor position must be set using multiples of 64 decipoints so that the starting position falls on an even byte boundary. Failure to use these multiples will result in the starting position being moved rightward to the next byte boundary.

Note that entering raster mode causes the printer to print any partial line of ASCII data (text) that has been received.

End Raster Graphics

The following escape sequence causes the printer to exit raster mode.

ESCAPE SEQUENCE: ESC * r # B

where # is ignored

After this sequence is received, any raster data remaining in the printer's buffer is printed. The left graphics margin and the graphics resolution can be changed only after the printer exits raster mode.

Color Planes

The following escape sequence prepares the printer to receive the specified number of color planes for each raster row.

ESCAPE SEQUENCE: ESC * r # U

where # = 1 (default), 2, 3, or 4

The number of color planes per row defines a depth for the picture. All undefined color planes within a raster row transfer are defaulted to all zeros. If extra color planes are sent, the data is ignored.

The color palette is reset to its default colors whenever the planes-per-row escape sequence is executed. Specifying other than 1 to 4 color planes results in the sequence being ignored.

Transfer Raster Data

The following escape sequences prepare the printer to receive the number of data bytes specified in the value field (#). The only difference between these sequences is the action that the printer performs after the data bytes are received.

ESCAPE SEQUENCES: **ESC * b # V**[data bytes] for multiple color planes

and/or

ESC * b # W[data bytes] for a single color plane or the last plane of a multi-plane sequence

where # = 0 to 32 767, the number of data bytes to be sent

NOTE: The brackets shown in the previous sequences are for clarity only. Do not include brackets when sending data bytes to the printer. ■

Use the **ESC * b # V** sequence *only* when you have specified *multiple* color planes with the **ESC * r # U** escape sequence. Upon completion of the data transfer, the current graphics position is reset to the left margin, and the color plane pointer is incremented to the next plane. The pixel row remains the same.

Use the **ESC * b # W** sequence when you have specified a *single* color plane. Or, use it for the last color plane when you have specified multiple planes. Upon completion of the data transfer, the current graphics position is reset to the left margin, the pixel row is incremented, and the color plane pointer is reset to the first color plane.

The data bytes must be sent in accordance with the currently specified transmission mode escape sequence, **ESC * b # M**. (Refer to page 5–22.)

Regardless of the transmission mode selected, the indicated number of data bytes must immediately follow the terminating character (**V** and/or **W**).

The number of data bytes required for a complete color plane is determined by the currently specified picture-width escape sequence, **ESC * r # S**. (Refer to page 5–19.) The maximum number of data bytes is 180 for an 8-inch page width. If the data sent exceeds the picture width, the excess data is discarded. If the picture width can accommodate more data than is sent, the undefined data is assumed to be all zeros. An empty color plane may also be sent, **ESC * b 0 V** or **ESC * b 0 W**, but the planes will still be filled out with zeros. The use of insufficient data to fill out the picture width and the use of empty color plane sequences are both recommended when data compaction is desired.

If an end raster graphics sequence, **ESC * r # B**, is received before a row is completed by sending **ESC * b # W**, graphics will be adversely affected in a device-dependent manner. The pixel row is not incremented.

All color planes exceeding the number specified per row are ignored. If an **ESC * b # W** is one of the extra color planes, the data is ignored, but the row is incremented and subsequent color planes are again interpreted as valid data.

Raster Graphics Program

The following examples illustrate how the transfer raster data escape sequences are used. One color plane is used to print the alternating black and white top bars. Three color planes are used to print the bottom bars in the other six primary colors: red, green, yellow, blue, magenta, and cyan. For the initial example, default conditions are in effect. The only exception is the number of color planes, which is changed to three to print the color bars.

Additional lines will be added to the program to show how other escape sequences change the color bars. All of the changes are illustrated in figures (reduced from 8.5 × 11-inch output) at the end of this chapter.

NOTE: The example has been tested using Microsoft® BASIC, version 3.11 on the HP Vectra PC. Other versions or releases may or may not support some of the BASIC commands such as `WIDTH "LPT1:",255`.

Also note that this version of Microsoft® BASIC may generate an extra line feed when sending CHR$(13) (carriage return) to the printer. Using CHR$(13) in a program can result in inaccurate transmission of raster graphics data. ■

Figure 1 at the end of this chapter shows the output from this program.

```
10  WIDTH "LPT1:",255
20  LPRINT CHR$(27)+"*r1U";
30  LPRINT CHR$(27)+"*r0A";
40  DIM R0$[96]
50  R0$=CHR$(27)+"*b90W"
60  FOR BLKWHTBAR=1 TO 3
70    FOR BLKBARBYTE=1 TO 15
80      R0$=R0$+CHR$(255)
90    NEXT BLKBARBYTE
100   FOR WHTBARBYTE=1 TO 15
110     R0$=R0$+CHR$(0)
120   NEXT WHTBARBYTE
130 NEXT BLKWHTBAR
140 FOR ROW=1 TO 45
150   LPRINT R0$;
160 NEXT ROW
170 LPRINT CHR$(27)+"*rB";
180 LPRINT CHR$(27)+"*r3U";
190 LPRINT CHR$(27)+"*r0A";
200 FOR COLRROW=1 TO 45
210   BITPOWER=1
220   FOR PLANENUM=1 TO 3
230     GOSUB 310
240     BITPOWER=2*BITPOWER
250   NEXT PLANENUM
260   LPRINT CHR$(27)+"*b0W";
270 NEXT COLRROW
280 LPRINT CHR$(27)+"*rB"
290 END
300 '
310    LPRINT CHR$(27)+"*b90V";
320    FOR COLR=1 TO 6
330      ONOFF=(COLR\BITPOWER) MOD 2
340      FOR BARBYTE=1 TO 15
350        IF (ONOFF=1) THEN LPRINT CHR$(255);
360        IF (ONOFF=0) THEN LPRINT CHR$(0);
370      NEXT BARBYTE
380    NEXT COLR
390  RETURN
```

10 disables automatic insertion of carriage returns and line feeds.

20 specifies one color plane.

30 starts one-color-plane raster graphics at left graphics margin.

40 specifies the number of bytes in RO$: 6 bytes for characters **ESC * b 90 W** + 90 data bytes = 96.

50 starts building the one-color-plane data string that contains 90 bytes.

60 begins loop to place data in RO$.

80 adds data for black bars.

110 adds data for white bars.

140 begins loop to print 45 dot rows.

170 ends one-color-plane raster graphics.

180 specifies three color planes.

190 starts three-color-plane raster graphics at the left graphics margin.

200 begins loop for 45 color raster rows.

210 sets the binary power to check first bit of the COLR variable byte.

220 begins loop for three color planes per row.

230 branches to routine to define and send three color planes per row.

240 sets the binary power to check the second and third bits of the COLR variable byte.

260 increments the raster row.

280 ends three-color-plane raster graphics and sends a carriage return to print data remaining in the printer's buffer.

310 specifies 90 bytes of data will be sent for each color plane.

320 begins loop to define the color plane data that will access palette index numbers 1–6.

330 checks bit values of COLR variable byte.

340 begins loop to send 15 data bytes per color bar based on value of the ONOFF variable.

390 returns program execution to line 240.

Raster Graphics Resolution

The following escape sequence defines the resolution at which graphics data is to be printed.

ESCAPE SEQUENCE: ESC * t # R

where # = 90 or 180

The value field (#) specifies the resolution in dots per inch. The printer defaults to 90 dpi, and only supports 90 dpi and 180 dpi resolutions.*

Once raster mode is entered, the resolution cannot be changed until an end raster graphics escape sequence, **ESC * r B**, is received.

You can readily see the effects of changing the resolution by adding the following program line to the previously shown listing. The resulting output is shown in Figure 2 at the end of this chapter. Notice that the printed image is only half as wide and half as high as the default (90 dpi) output. The default picture width (1440 dots) is still in effect. Therefore, the 90 bytes of data sent in each raster data transfer is filled out with all zeros. These zeros are interpreted as white for one color plane and black for two or more color planes.

```
11 LPRINT CHR$(27)+"*t180R";
```

*Since the printer does not have infinite resolution, the resolution requested is mapped to the closest supported resolution that assures printing the picture without data loss. Therefore, if the resolution requested is greater than 90 dpi, 180 dpi is selected; otherwise, 90 dpi is selected.

Color Palette Customizing

Use the following escape sequences to assign any of the printer's available colors to the index numbers of the color palette.

ESCAPE SEQUENCES: **ESC * v # A** red component
ESC * v # B green component
ESC * v # C blue component

where # = 1 to 32 767

and

ESC * v # I index number assignment

where # = 0 to 15

Although real values between 1 and 32 767 are allowed for the RGB value fields (#), integer values in a much smaller range are adequate to define colors. These RGB integer ranges are listed below.

Red component	4 to 90
Green component	4 to 88
Blue component	6 to 85

The table beginning on page 5-24 contains the specific integer values for each of the printer's colors.

The RGB components currently specified when the **ESC * v # I** sequence is received are assigned to the defined index number. However, the number of color planes currently specified limits the number of index numbers that can be accessed in the color palette. Therefore, the value field (#) for the index number assignment should be limited to an integer value between 0 and $(2^n) - 1$; where "n" is the number of color planes currently specified.

Number of Color Planes	Accessible Index Numbers
1	0 to 1
2	0 to 3
3	0 to 7
4	0 to 15

Remember that a customized color palette is reset to the default colors whenever the number of color planes sequence, **ESC*r#U**, is executed.

The specified RGB color components are reset to zero after each color-assignment sequence, **ESC*v#A/B/C** followed by **ESC*v#I**, is received. If one or more of the RGB-color-component sequences is not specified before the next index number assignment, **ESC*v#I**, is received, the missing RGB color component remains set to zero.

The effects of changing the color assignments can readily be seen by adding the following program lines to the previously shown listing. The resulting output is shown in Figure 3 at the end of this chapter. Notice that the white bars and the 90 bytes of data that are filled out with all zeros are now printed in magenta.

```
21  LPRINT CHR$(27)+"*v53A";
22  LPRINT CHR$(27)+"*v5B";
23  LPRINT CHR$(27)+"*v25C";
24  LPRINT CHR$(27)+"*v0I";
```

Picture Width

The following escape sequence defines a width for the picture.

ESCAPE SEQUENCE: ESC * r # S

where # = 0 to 32 767

The value field (#) specifies the width of the picture in pixels. The default picture width is 1440 dots, the maximum printable width of a page.

The default picture width allows each row of the picture to be defined with 180 data bytes at 180 dpi, or 90 bytes at 90 dpi. (Remember that, at 90 dpi, four dots are defined by each bit.) If the data sent exceeds the picture width, the excess data is discarded. If insufficient data is sent, the undefined data is assumed to be all zeros.

You can see the effects of changing the picture width by adding the following program line to the previously shown listing. The resulting output is shown in Figure 4 at the end of this chapter. Notice that the defined 90 bytes now fill the specified picture width.

```
12 LPRINT CHR$(27)+"*r720S";
```

With a reduced width, you can now center the picture on the page by adding the following program lines. **ESC & a 1472 H** moves the current active horizontal position; **ESC * r 1 A** implements that position as the new left graphics margin. The resulting output is shown in Figure 5. Notice that changing the picture width and moving the left graphics margin effectively eliminates the need to send pixel data to account for the white space that surrounds centered raster images.

```
13  LPRINT CHR$(27)+"&a1472H";
30  LPRINT CHR$(27)+"*r1A";
190 LPRINT CHR$(27)+"*r1A";
```

Temporary Horizontal Offset

The following escape sequence defines a horizontal offset to the right of the left graphics margin.

ESCAPE SEQUENCE: ESC * b # X

where # = 0 to 32 767

The value field (#) specifies the number of binary zeros the printer is to insert in front of the received color plane data. These leading zeros effectively offset the received binary data to the right of the left graphics margin.

Note that the specified offset is not the same as leading white space, since the inserted zeros are interpreted the same as received binary data. The specified offset remains in effect *only until the row position is incremented.* Incrementing the row resets the offset to the default value (0).

The printer requires the offset to fall on a byte boundary. The value field is therefore interpreted as follows:

byte offset = (argument\8)

where \ denotes integer division

Your defined picture width should equal, in bits, the offset plus the data. For example:

picture width = offset + data

720 = 120 + 600 (600/8 = 75 bytes for five color bars)

You can see the effects of specifying a horizontal offset by adding the following program line. The resulting output is shown in Figure 6 at the end of this chapter. Notice that the top six color bars are offset one bar width to the right. The right-most magenta bar is clipped off because it extends beyond the picture width. A new magenta bar is printed on the left side due to the inserted leading zeros. The position of the bottom six color bars remains unchanged.

```
141 LPRINT CHR$(27)+"*b120X";
```

Vertical Offset

The following escape sequence defines a vertical offset.

ESCAPE SEQUENCE: ESC * b # Y

where # = −5 to +32 767

The value field (#) specifies the number of pixels (effectively rows) that *subsequent raster rows* are to be offset (moved) vertically. The specified offset is permanent.

No sign or a plus (+) sign in the value field moves the current print position down by the number of rows specified.

A minus (−) sign in the value field moves the current print position upward by the number of rows specified. However, *movement in the negative direction is limited to a maximum of five rows at a time.*

Remember that rows are interpreted in terms of DPI. Therefore:

- At 90 dpi, **ESC * b 90 Y** results in an offset of 90 rows, or one inch.
- At 180 dpi, **ESC * b 180 Y** results in an offset of 180 rows, or one inch.

You can see the effects of specifying a vertical offset by adding the following program line to the previously shown listing. The resulting output is shown in Figure 7. Notice that the bottom six color bars are offset down by 20 raster rows.

```
131 LPRINT CHR$(27)+"*b20Y";
```

Transmission Mode

The following escape sequence defines the mode for interpreting the data following the **ESC * b # V** and **ESC * b # W** transfer raster data sequences.

ESCAPE SEQUENCE: ESC * b # M

where # = 0 (default) or 1

The value field (#) specifies the mode for interpreting the data sequence in a raster data transfer by row or by plane. The mode remains in effect until explicitly changed, or the printer is reset.

Mode zero indicates unencoded transmission. Data will be treated as a strict binary transfer, with each bit describing a single pixel. The most significant bit (bit 7) of the first byte corresponds to the first (leftmost) pixel within a row; bit 6 corresponds to the next pixel, and so on.

Mode one indicates that the data is "run-length" encoded, such that the data consists of byte pairs. The first byte of each byte pair is a repetition count; the second byte is a pattern byte. The repetition count specifies how many times the following pattern byte should be repeated in the raster graphics data being received. The repetition count can vary between 0 and 255. A zero means that the pattern isn't repeated; that is, it occurs only once. A count of one means that the pattern occurs twice; a count of two means that the pattern occurs three times, and so on. In the following example, a count of 14 (line 130) means that the pattern occurs 15 times.

Example of Run-Length Encoding

The following program uses the run-length encoding mode with the transfer raster data escape sequences. The resulting output is shown in Figure 8. Notice that only 12 bytes of data per row need to be sent to generate each black or magenta color bar.

```
10  WIDTH "LPT1:",255
20  LPRINT CHR$(27)+"*t90R";
30  LPRINT CHR$(27)+"*r1U";
40  LPRINT CHR$(27)+"*v53A";
50  LPRINT CHR$(27)+"*v5B";
60  LPRINT CHR$(27)+"*v25C";
70  LPRINT CHR$(27)+"*v0I";
80  LPRINT CHR$(27)+"*r0A";
90  DIM R0$[18]
100 LPRINT CHR$(27)+"*b1M";
110 R0$=CHR$(27)+"*b12W"
120 FOR BLKWHTBAR=1 TO 3
130   R0$=R0$+CHR$(14)+CHR$(255)+CHR$(14)+CHR$(0)
140 NEXT BLKWHTBAR
150 FOR ROW = 1 TO 45
160   LPRINT R0$;
170 NEXT ROW
180 LPRINT CHR$(27)+"*rB"
190 END
```


20 specifies 90-dpi resolution.

30 specifies one color plane.

40–70 redefine palette index number 0 as magenta.

80 begins graphics at left graphics margin.

90 specifies number of bytes in RO$ (6 bytes for characters **ESC * b 12 W** + 12 data bytes = 18).

100 instructs printer to interpret binary data as run-length-encoded byte pairs.

110 starts building RO$ string, to which 12 data bytes will be added.

120 begins loop to place data in RO$.

130 adds data in byte pairs; CHR$(14) is a repetition byte count, CHR$(255) and CHR$(0) are the pattern bytes.

Tables of NTSC Standardized RGB Values

The row/column numbers in the following tables are keyed to the row/column numbers on the printer's color spectrum (see page 5-7). To view the spectrum, turn the printer OFF. Then *hold down* the **LF** button while pressing and releasing the **ON/OFF** button. The spectrum will appear on the second page of output.

Use the RGB values with the **ESC * v # A/B/C** escape sequence to assign any of the colors to the 16-color palette (see page 5-17).

The RGB values are based on images generated on PaintJet Paper, the paper recommended for use with PaintJet. Because readings always vary slightly, the values in the table are approximate.

Color Spectrum

Row, Column	NTSC Standardized RGB		
	Red	Green	Blue
1, 1	4	4	12
1, 2	6	5	16
1, 3	6	6	21
1, 4	4	4	19
1, 5	6	5	24
1, 6	6	6	25
1, 7	5	5	31
1, 8	4	4	29
1, 9	8	9	26
1,10	9	9	26
2, 1	9	8	26
2, 2	9	9	25
2, 3	14	11	27
2, 4	25	24	54
2, 5	6	6	13
2, 6	11	8	20
2, 7	11	8	18
2, 8	9	7	20
2, 9	9	7	23
2,10	10	7	24

Row, Column	NTSC Standardized RGB		
	Red	Green	Blue
3, 1	6	4	18
3, 2	8	6	24
3, 3	5	5	20
3, 4	6	4	28
3, 5	6	5	30
3, 6	8	6	35
3, 7	13	8	38
3, 8	12	9	27
3, 9	12	10	27
3,10	10	10	26
4, 1	30	27	56
4, 2	6	5	10
4, 3	6	4	11
4, 4	11	7	20
4, 5	11	6	19
4, 6	12	6	24
4, 7	9	5	22
4, 8	11	6	22
4, 9	10	4	27
4,10	9	4	30

(Table continues)

Row, Column	NTSC Standardized RGB		
	Red	Green	Blue
5, 1	9	5	30
5, 2	10	7	36
5, 3	11	8	16
5, 4	14	9	16
5, 5	11	7	17
5, 6	12	7	16
5, 7	12	5	14
5, 8	11	5	21
5, 9	11	4	17
5,10	21	10	25
6, 1	23	11	26
6, 2	13	8	14
6, 3	10	8	14
6, 4	10	8	13
6, 5	10	7	14
6, 6	21	12	25
6, 7	20	5	29
6, 8	24	5	31
6, 9	21	9	38
6,10	26	10	40
7, 1	27	14	27
7, 2	23	12	26
7, 3	6	5	8
7, 4	25	15	20
7, 5	10	6	14
7, 6	12	7	13
7, 7	22	8	18
7, 8	20	8	18
7, 9	20	8	22
7,10	21	9	19
8, 1	20	6	18
8, 2	20	5	21
8, 3	20	4	25
8, 4	23	6	23
8, 5	21	8	22
8, 6	20	6	22
8, 7	22	10	19
8, 8	34	19	31
8, 9	25	17	20
8,10	22	15	19

Row, Column	NTSC Standardized RGB		
	Red	Green	Blue
9, 1	23	15	20
9, 2	22	14	20
9, 3	23	12	20
9, 4	21	7	16
9, 5	26	5	17
9, 6	28	7	21
9, 7	53	5	25
9, 8	58	7	31
9, 9	65	19	43
9,10	76	45	62
10, 1	12	5	11
10, 2	21	9	17
10, 3	23	9	17
10, 4	21	9	16
10, 5	21	9	15
10, 6	25	6	14
10, 7	52	6	19
10, 8	57	9	21
10, 9	58	12	21
10,10	63	17	26
11, 1	64	19	26
11, 2	12	5	10
11, 3	25	6	12
11, 4	28	9	15
11, 5	29	11	15
11, 6	53	7	16
11, 7	53	8	15
11, 8	53	8	14
11, 9	32	17	18
11,10	32	21	18
12, 1	11	6	9
12, 2	24	6	11
12, 3	27	10	12
12, 4	57	10	16
12, 5	57	12	17
12, 6	57	11	14
12, 7	56	12	14
12, 8	7	5	7
12, 9	12	8	10
12,10	13	9	10

(Table continues)

Row, Column	NTSC Standardized RGB		
	Red	Green	Blue
13, 1	27	11	11
13, 2	27	10	11
13, 3	57	12	13
13, 4	62	18	18
13, 5	63	20	15
13, 6	64	24	18
13, 7	73	40	37
13, 8	75	45	38
13, 9	13	9	9
13,10	31	18	13
14, 1	30	18	13
14, 2	30	19	11
14, 3	63	22	18
14, 4	63	21	15
14, 5	62	21	13
14, 6	73	41	22
14, 7	74	45	22
14, 8	73	41	16
14, 9	72	41	13
14,10	74	44	16
15, 1	15	16	9
15, 2	38	39	12
15, 3	37	39	16
15, 4	89	83	13
15, 5	89	85	19
15, 6	89	87	31
15, 7	89	88	54
15, 8	7	8	7
15, 9	14	14	13
15,10	14	16	11
16, 1	15	27	13
16, 2	30	53	16
16, 3	29	56	20
16, 4	34	57	21
16, 5	25	27	18
16, 6	25	27	16
16, 7	28	28	18
16, 8	40	41	26
16, 9	6	12	10
16,10	13	25	17

Row, Column	NTSC Standardized RGB		
	Red	Green	Blue
17, 1	13	26	16
17, 2	10	38	22
17, 3	12	38	18
17, 4	29	57	28
17, 5	35	58	29
17, 6	24	27	18
17, 7	27	27	19
17, 8	6	7	10
17, 9	12	13	14
17,10	11	13	15
18, 1	11	13	16
18, 2	13	13	14
18, 3	4	9	11
18, 4	6	11	12
18, 5	9	20	18
18, 6	6	19	18
18, 7	11	27	23
18, 8	6	19	14
18, 9	5	31	21
18,10	11	39	21
19, 1	25	29	22
19, 2	30	30	23
19, 3	4	6	8
19, 4	5	11	11
19, 5	6	11	14
19, 6	8	19	20
19, 7	4	16	16
19, 8	5	20	17
19, 9	4	30	24
19,10	5	30	23
20, 1	9	39	27
20, 2	15	41	30
20, 3	12	40	28
20, 4	28	58	45
20, 5	37	58	49
20, 6	25	26	22
20, 7	28	27	23
20, 8	27	28	22
20, 9	4	9	12
20,10	12	12	18

(Table continues)

Row, Column	NTSC Standardized RGB		
	Red	Green	Blue
21, 1	6	17	21
21, 2	5	17	22
21, 3	6	16	22
21, 4	9	19	24
21, 5	6	17	19
21, 6	9	20	24
21, 7	3	15	19
21, 8	11	21	19
21, 9	13	20	21
21,10	9	19	20
22, 1	3	26	22
22, 2	5	30	29
22, 3	4	30	28
22, 4	3	26	25
22, 5	17	28	24
22, 6	6	11	16
22, 7	6	11	17
22, 8	4	10	17
22, 9	6	10	16
22,10	9	20	23
23, 1	13	21	24
23, 2	11	20	23
23, 3	13	20	25
23, 4	5	16	24
23, 5	4	16	23
23, 6	5	19	22
23, 7	2	25	30
23, 8	8	39	42
23, 9	9	39	45
23,10	4	6	9
24, 1	5	10	16
24, 2	5	11	18
24, 3	6	11	19
24, 4	3	8	16
24, 5	6	16	26
24, 6	4	17	24
24, 7	3	15	23
24, 8	6	17	25
24, 9	4	14	25
24,10	7	19	23

Row, Column	NTSC Standardized RGB		
	Red	Green	Blue
25, 1	2	24	41
25, 2	3	30	41
25, 3	5	30	43
25, 4	4	6	11
25, 5	6	7	15
25, 6	9	11	19
25, 7	12	11	19
25, 8	8	11	22
25, 9	10	12	21
25,10	7	9	19
26, 1	4	10	19
26, 2	7	12	19
26, 3	6	11	20
26, 4	4	10	24
26, 5	6	11	22
26, 6	6	10	23
26, 7	6	11	23
26, 8	6	14	34
26, 9	4	14	32
26,10	5	16	33
27, 1	3	14	34
27, 2	3	14	33
27, 3	6	15	33
27, 4	5	18	36
27, 5	9	17	33
27, 6	8	17	31
27, 7	10	19	32
27, 8	8	17	32
27, 9	13	20	34
27,10	16	27	39
28, 1	6	7	8
28, 2	6	7	11
28, 3	6	7	12
28, 4	6	6	11
28, 5	12	12	19
28, 6	4	5	13
28, 7	4	7	17
28, 8	4	8	25
28, 9	6	9	26
28,10	4	8	29

(Table continues)

Row, Column	NTSC Standardized RGB		
	Red	Green	Blue
29, 1	2	22	64
29, 2	3	27	68
29, 3	12	39	73
29, 4	38	58	78
29, 5	6	7	21
29, 6	6	8	28
29, 7	6	8	29
29, 8	5	8	25
29, 9	4	7	26
29,10	5	8	27
30, 1	6	9	27
30, 2	3	10	46
30, 3	5	11	47
30, 4	6	13	49
30, 5	10	16	52
30, 6	4	4	8
30, 7	5	6	13
30, 8	6	7	16
30, 9	6	7	17
30,10	6	7	25
31, 1	4	6	22
31, 2	6	7	26
31, 3	4	7	36
31, 4	9	14	50
31, 5	12	12	22
31, 6	12	13	21
31, 7	12	15	19
31, 8	11	13	21
31, 9	6	6	17
31,10	4	5	32

Row, Column	NTSC Standardized RGB		
	Red	Green	Blue
32, 1	5	6	36
32, 2	6	7	36
32, 3	12	12	23
32, 4	12	10	22
32, 5	14	12	18
32, 6	23	14	17
32, 7	23	14	18
32, 8	24	14	17
32, 9	22	14	17
32,10	23	14	15
33, 1	24	27	33
33, 2	11	14	18
33, 3	14	14	18
33, 4	28	27	34
33, 5	25	25	33
33, 6	27	24	34
33, 7	4	4	6
33, 8	15	16	18
33, 9	43	43	45
33,10	90	88	85

Plotter Pen Colors

The following tables lists the RGB values for PaintJet colors that most closely match HP plotter pen colors.

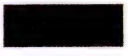
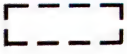
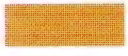
Color	Row, Column	NTSC Standardized RGB		
		Red	Green	Blue
black	33,7	4	4	6
red	11,8	53	8	14
blue	31,3	4	7	36
yellow	15,4	89	83	13
green	18,8	6	19	14
red-violet	8,3	20	4	25
aqua	24,9	4	14	25
orange	14,9	72	41	13
purple	4,6	12	6	24
brown	12,9	12	8	10

Default Color Palette

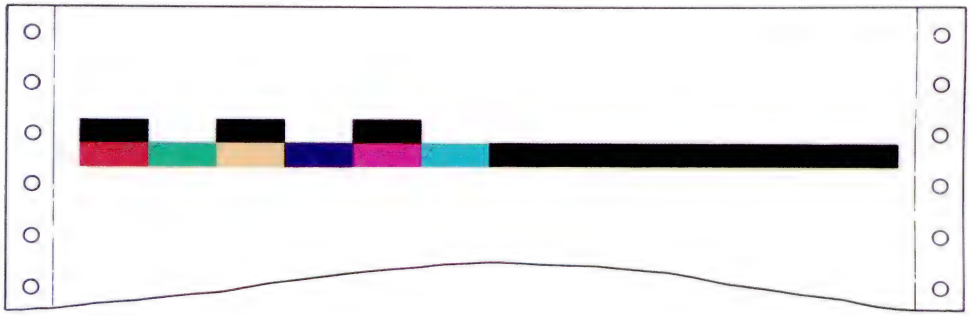
Below are the RGB values for the default palette. The availability of the colors depends upon the number of color planes specified by the **ESC * r # U** escape sequence. (Refer to page 5-10.) The colors in the default palette are shown in the chart on the following page.

Palette Index Number	Color	Row Column	NTSC Standardized RGB		
			Red	Green	Blue
0	black	33, 7	4	4	6
1	red	11, 8	53	8	14
2	green	22, 1	3	26	22
3	yellow	15, 4	89	83	13
4	blue	1, 8	4	4	29
5	magenta	9, 7	53	5	25
6	cyan	29, 1	2	22	64
7	orange	14, 9	72	41	13
8	purple	4, 6	12	6	24
9	brown	12, 9	12	8	10
10	dark gray	33, 8	15	16	18
11	light gray	33, 9	43	43	45
12	pink	10, 7	52	6	19
13	light blue	30, 2	3	10	46
14	light yellow	15, 6	89	87	31
15	white	33,10	90	88	85

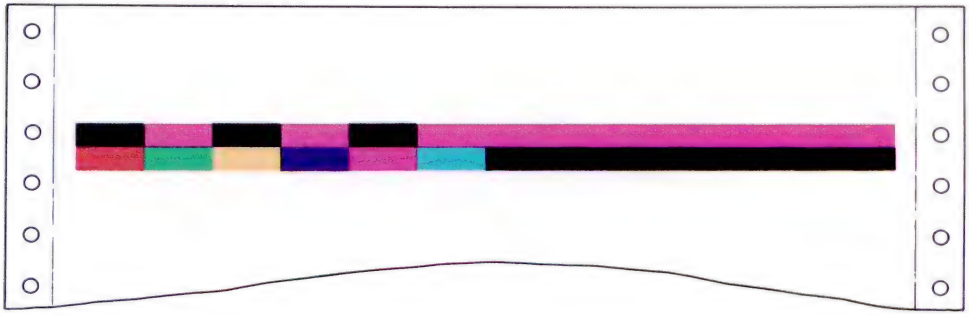
Default Graphics Color Palette

Palette Index Number	Number of Color Planes			
	1	2	3	4 (90 dpi)
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

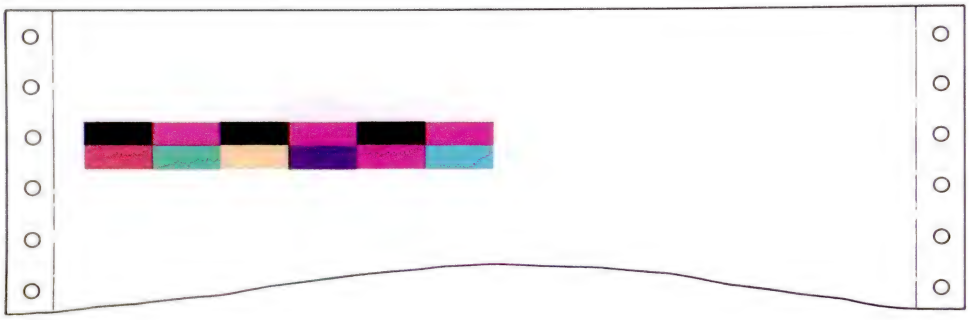
1



2

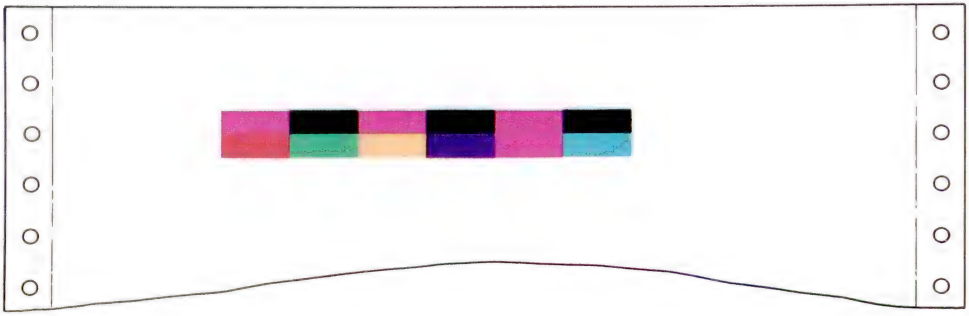


3



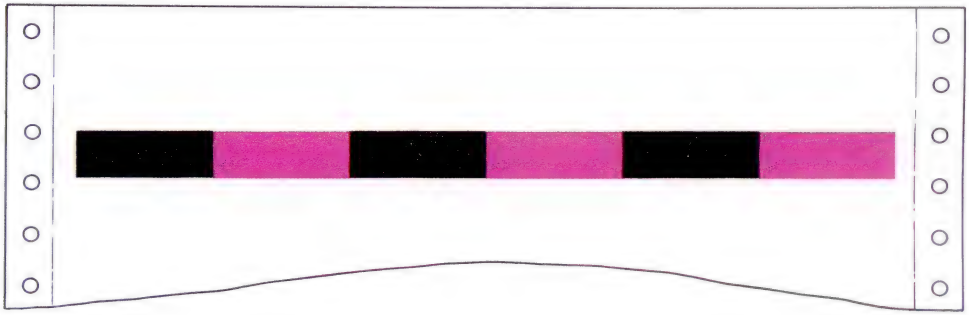
4

5



6

7



8

6

Downloadable Characters

The information in this chapter is for those users who want to create downloadable (user-defined) characters for special applications. The general concepts regarding downloadable characters are presented first, followed by more detailed explanations of individual escape sequences.

The printer has sufficient RAM memory for one downloaded character set. The three escape sequences required to create the downloaded character set must be sent in the following order.

ESC)s#W create RAM font

ESC*c#E specify character code for next character

ESC(s#W define character data

The create RAM font sequence is sent only once. The character code and download character data sequences must be sent for *each* character downloaded to the RAM font. You can assign downloaded characters to any ASCII character codes from 0 to 255, except 32.

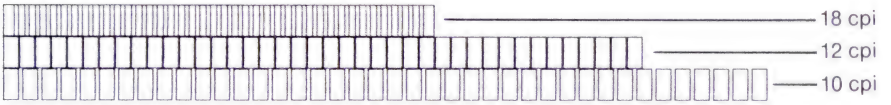
In order to print the characters you have defined, you must select the downloadable set as either the primary or secondary character set using **ESC(#X** or **ESC)#X**.

Available Memory

If available memory is exceeded as characters are downloaded, the entire RAM font is deleted. The number of characters that can be downloaded without exceeding available memory is dependent on the amount of data compaction that occurs. *Automatic data compaction can occur only when consecutive byte pairs of the downloaded character data are repetitive.* If character design allows no data compaction, you can still download at least 96 characters before exceeding available memory.

NOTE: RAM that is not used for downloaded characters is used for processing of text and graphics. As characters are downloaded to the RAM font, the time during which the computer is tied up may be affected. ■

A 15 × 30 dot character cell is used to design downloadable characters. Because of the fixed size of the character cell, *downloadable characters are fully compatible only with 12-cpi pitch fonts.* That is, the character cells will print overlapped at 18-cpi pitch, butted together at 12-cpi pitch, and separated at 10-cpi pitch.



Downloaded characters are defaulted to the normal stroke weight, regardless of whether the RAM font is designated as primary or secondary. After the RAM font is designated, it is subject to all currently invoked printing features. The stroke weight may also be changed to bold using the appropriate stroke weight escape sequence, **ESC (s # B** or **ESC) s # B**.

NOTE: The same algorithm creates bold stroke weight for the printer's internal fonts and for the RAM font. ■

Create RAM Font

The following escape sequence instructs the printer to create a fixed-format RAM font.

ESCAPE SEQUENCE: **ESC) s W**

or

ESC) s # W[font descriptor block]

where # is the number of bytes in the font descriptor block

The preferred form for this printer is **ESC) s W**.

The printer *does not use* the descriptor data in the second form, which exists for compatibility with other Hewlett-Packard printers. For example, if the printer receives **ESC) s 6 W**[6 bytes . . .], it will read and then discard the 6 bytes which make up the font descriptor block.

When the printer receives this escape sequence, *any existing RAM font is deleted* and a new RAM font is created. The RAM font remains in memory until it is specifically deleted using the **ESC * c # F** escape sequence, another **ESC) s W** sequence is issued, or the printer is turned off. *The RAM font is not affected by an* **ESC E** *reset.*

NOTE: Any existing RAM font is deleted whenever the INIT line on a Parallel interface is pulled low. (See Appendix C.) ■

Delete RAM font

The following escape sequence instructs the printer to delete any existing RAM font.

ESCAPE SEQUENCE: ESC * c # F

where # is 0 or 2

This escape sequence is implemented primarily for compatibility with other Hewlett-Packard printers. It is not necessary in that the **ESC) s W** sequence deletes any existing RAM font before creating a new one.

Specify Character Code

The following escape sequence specifies the decimal value of the next character to be downloaded to the RAM font.

ESCAPE SEQUENCE: ESC * c # E

where # = 0 to 31 or 33 to 255

The value field (#) specifies the character code for the next downloaded character in terms of a decimal value in the range of 0 to 31 or 33 to 255. Decimal value 32 is reserved for the space character that is predefined in the RAM font. Note that downloaded characters assigned to decimal values 0, 7–15, and 27 can be printed only after the transparent print data escape sequence, **ESC & p # X**, has been issued.

Download Character Data

The following escape sequence defines the dot pattern of a single character and downloads the character data to the RAM font where it is stored under the currently specified character code.

ESCAPE SEQUENCE: **ESC (s # W**[character data]

where # = 63 = number of [character data] bytes to be sent

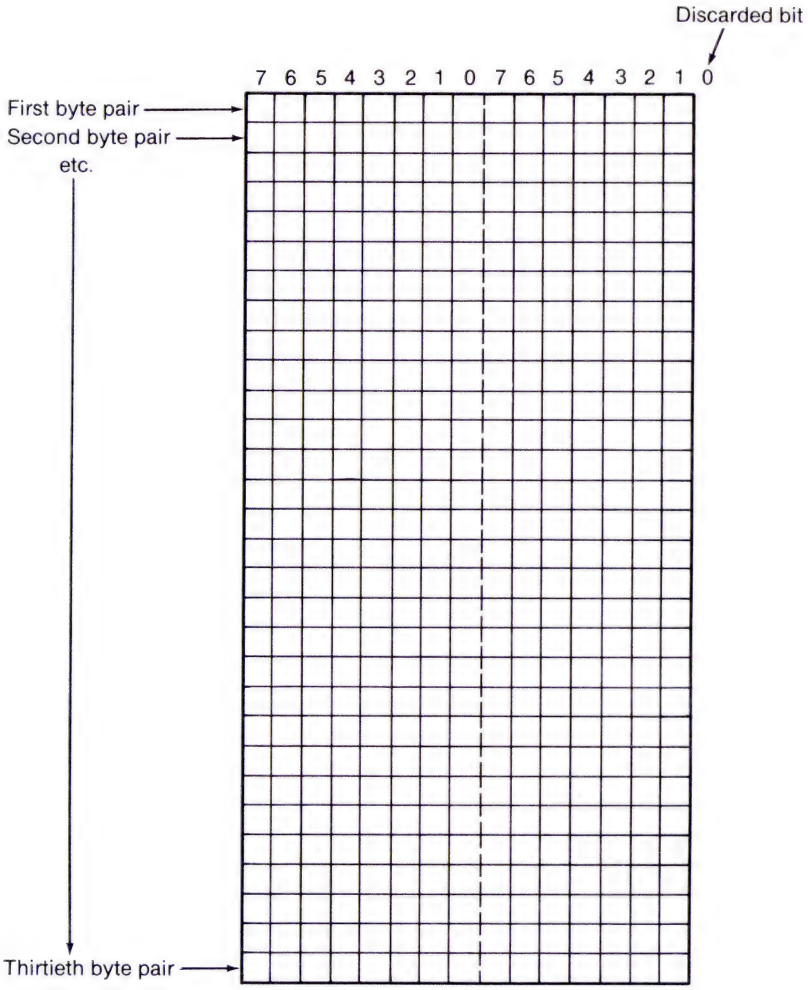
The value field (#) specifies the number of bytes required to define the character format and the specific dot pattern of the character. The three character format bytes shown below *must always be sent prior* to the 60 character data bytes.

byte 1	=	binary 6
byte 2	=	binary 0
byte 3	=	binary 1
bytes 4–63	=	any combination of bytes in the binary range 0–255

The printer interprets the 60 bytes of character data in *byte pairs* to form a 15 × 30 bit map of the character. (Refer to the figure on the following page.) That is, the first two bytes are used to define the upper dot row of the character. The next two bytes define the second dot row, and so on until all 30 dot rows are defined. Note that only 15 bits of each byte pair are significant; the least significant bit of the second byte is discarded.

The bits of character data (1's and 0's) describe single dots to be printed on the page. A one indicates that the dot is to be printed; a zero indicates that the dot should not be printed.

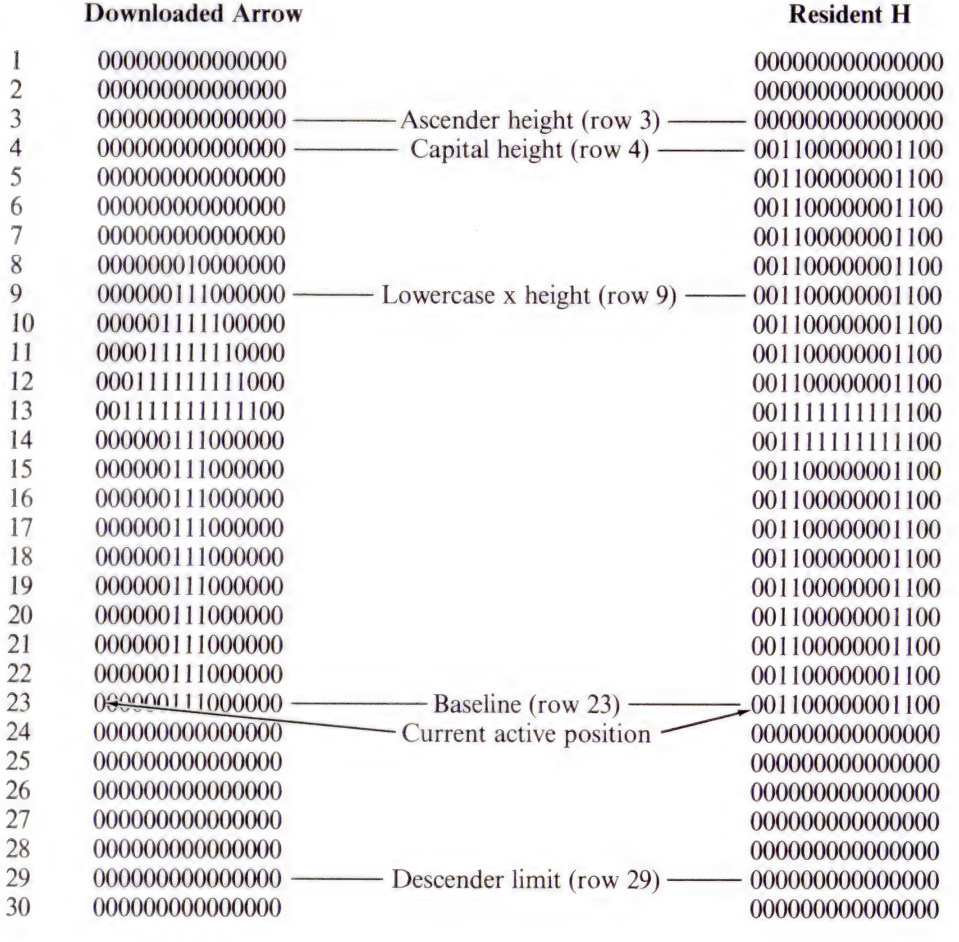
NOTE: If you specify a character code that has been previously used for an existing character, the new character will be used in subsequent printing. To obtain the maximum number of characters in memory, however, do not redefine existing characters. **Remember that the entire RAM font is deleted if an out-of-memory condition occurs during character downloading.** ■



Downloadable Character Cell

Creating a Downloadable Character

The following illustration shows how, within identical cells, the character data defines the dot pattern of a downloaded arrow symbol and the capital letter H of a resident 12-pitch font. The height of lowercase letters and the limits of their ascenders and descenders are also shown. The left end of the baseline defines where the cell is to be printed with respect to the active print position.



The following program downloads the arrow symbol to character code 1 in the RAM font. It then prints the downloaded symbol on the same line with the capital letter H in each of the available pitch fonts, as shown below.

```
10 DIM DWNLOAD$[69]
20 LPRINT CHR$(27)+")sW"
30 LPRINT CHR$(27)+"*c1E"
40 DWNLOAD$=CHR$(27)+"(s63W"
50 FOR BYTE=1 TO 63
60   READ CHRVALUE
70   DWNLOAD$=DWNLOAD$+CHR$(CHRVALUE)
80 NEXT BYTE
90 LPRINT DWNLOAD$
100 LPRINT CHR$(27)+"(0@"
110 LPRINT CHR$(27)+")X"
120 FOR PITCH=1 TO 3
130   IF PITCH=1 THEN LPRINT CHR$(27)+"&k2S"
140   IF PITCH=2 THEN LPRINT CHR$(27)+"&k4S"
150   IF PITCH=3 THEN LPRINT CHR$(27)+"&k3S"
160   LPRINT CHR$(14)+CHR$(1)+CHR$(15)+CHR$(72);
170 NEXT PITCH
180 DATA 6,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0
190 DATA 1,0,3,128,7,192,15,224,31,240,63,248
200 DATA 3,128,3,128,3,128,3,128,3,128,3,128
210 DATA 3,128,3,128,3,128,3,128
220 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0
230 END
```

↑H
↑H
↑H

10 specifies number of bytes in DWNLOAD$: 6 bytes for characters **ESC (s 63 W** + 3 format bytes + 60 data bytes = 69.

20 creates RAM font.

30 specifies ASCII code 1 for character to be downloaded.

40 starts building character data string.

50 begins loop to place data (read from lines 180–220) in DWNLOAD$. This includes the 3 essential character format bytes (6, 0, 1) and the 60 bytes of character data (30 byte pairs) that define the arrow.

90 sends DWNLOAD$ data to printer.

100 selects the power-up default set as the primary symbol set.

110 selects the downloadable set as the secondary set.

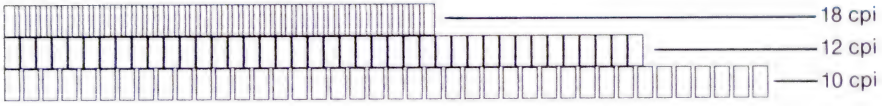
120 begins loop that will print characters in each of three pitches.

130–150 establish 18-pitch, 12-pitch, and 10-pitch printing, respectively.

160 shifts out to secondary set to print arrow, then shifts back in to primary set to print H.

The next program creates the figure shown below and on page 6-2. It downloads a cell outline to character code 2 in the RAM font. It then prints a partial line of the downloaded cell outline in each of the available pitches. This example graphically shows that the downloaded character cell prints overlapped at 18-cpi pitch, butted together at 12-cpi pitch, and separated at 10-cpi pitch.

```
10 DIM DWNLOAD$[69]
20 LPRINT CHR$(27)+")sW"
30 LPRINT CHR$(27)+"*c2E"
40 DWNLOAD$=CHR$(27)+"(s63W"+CHR$(6)+CHR$(0)+CHR$(1)
50 DWNLOAD$=DWNLOAD$+CHR$(255)+CHR$(255)
60 FOR ROW=2 TO 29
70   DWNLOAD$=DWNLOAD$+CHR$(128)+CHR$(2)
80 NEXT ROW
90 DWNLOAD$=DWNLOAD$+CHR$(255)+CHR$(255)
100 LPRINT DWNLOAD$
110 LPRINT CHR$(27)+"(X"
120 FOR PITCH=1 TO 3
130   IF PITCH=1 THEN LPRINT CHR$(27)+"&k2S";
140   IF PITCH=2 THEN LPRINT CHR$(27)+"&k4S";
150   IF PITCH=3 THEN LPRINT CHR$(27)+"&k3S";
160   FOR CHARACTER=1 TO 40
170     LPRINT CHR$(2);
180   NEXT CHARACTER
190 LPRINT
200 NEXT PITCH
210 END
```



NOTE: After you have downloaded a character(s) in this manner, you must shift back to (or designate and select) one of the printer's resident symbol sets before the printer will print in a resident symbol set. ■

30 specifies ASCII code 2 for character to be downloaded.

40 starts building character data string with escape sequence and 3 essential format bytes.

50 adds first byte pair (all ones) to define first row of character cell.

60 begins loop that adds identical byte pairs to define rows 2–29 of character cell.

90 adds last byte pair to define last row of character cell.

100 sends DWNLOAD$ data to printer.

110 selects the downloadable set as the primary set.

120 begins loop that will print a cell line in each of three pitches.

160 begins loop that will print a line of 40 cells.

190 generates **CR LF** to print the next line.

A

Reference Table of Print Features

NOTE: When using the decimal or hexadecimal form of these escape sequences, you must substitute the decimal or hexadecimal form *of each digit of the value field* #. For example, the character 7 is represented in ASCII as 55 decimal or 37 hexadecimal; the character 2 is represented in ASCII as 50 decimal or 32 hexadecimal (see Appendix B). Therefore, the escape sequence **ESC & *l* 72 P** has a decimal form of 27,38,108,55,50,80 and a hexadecimal form of 1B,26,6C,37,32,50. ■

Print Feature	Escape Sequence or Control Code	ASCII Decimal Equivalent	ASCII Hexadecimal Equivalent
Printing Self Test			
Print self test	ESC z	27 122	1B 7A
Reset			
Reset printer to defaults	ESC E	27 69	1B 45
Print Pitches			
10 cpi, 80 cpl (default)	ESC & k 0 S	27 38 107 48 83	1B 26 6B 30 53
10 cpi, 80 cpl	ESC & k 3 S	27 38 107 51 83	1B 26 6B 33 53
12 cpi, 96 cpl	ESC & k 4 S	27 38 107 52 83	1B 26 6B 34 53
18 cpi, 144 cpl	ESC & k 2 S	27 38 107 50 83	1B 26 6B 32 53
Bold Mode			
Primary symbol set			
Bold print	ESC (s 1 B	27 40 115 49 66	1B 28 73 31 42
Normal print (default)	ESC (s 0 B	27 40 115 48 66	1B 28 73 30 42
Secondary symbol set			
Bold print (default)	ESC) s 1 B	27 41 115 49 66	1B 29 73 31 42
Normal print	ESC) s 0 B	27 41 115 48 66	1B 29 73 30 42
Underline			
Underline on	ESC & d D	27 38 100 68	1B 26 64 44
Normal (default)	ESC & d @	27 38 100 64	1B 26 64 40

(Table continues)

Print Feature	Escape Sequence or Control Code	ASCII Decimal Equivalent	ASCII Hexadecimal Equivalent
Line Spacing			
6 lines/inch (default)	ESC&/6D	27 38 108 54 68	1B 26 6C 36 44
8 lines/inch	ESC&/8D	27 38 108 56 68	1B 26 6C 38 44
9 lines/inch	ESC&/9D	27 38 108 57 68	1B 26 6C 39 44
Perforation Skip			
Off (default)	ESC&/0L	27 38 108 48 76	1B 26 6C 30 4C
On	ESC&/1L	27 38 108 49 76	1B 26 6C 31 4C
Page Length			
# lines/page default: 66 lines, English 72 lines, metric	ESC&/#P	27 38 108 __ 80	1B 26 6C __ 50
Text Length			
# lines/text area default: 60 lines, English 66 lines, metric	ESC&/#F	27 38 108 __ 70	1B 26 6C __ 46
Transparent Print Data			
Transfer # bytes of transparent data	ESC&p#X [data]	27 38 112 __ 88	1B 26 70 __ 58
Display Functions Mode			
Display functions on	ESCY	27 89	1B 59
Display functions off (default)	ESCZ	27 90	1B 5A
Print Mode			
Unidirectional text printing	ESC&k0W	27 38 107 48 87	1B 26 6B 30 57
Bidirectional text printing (default)	ESC&k1W	27 38 107 49 87	1B 26 6B 31 57
Transparency print mode	ESC&k3W	27 38 107 51 87	1B 26 6B 33 57
Print Position			
Half line feed	ESC=	27 61	1B 3D
Line feed	CTRL J	10	0A
Carriage return	CTRL M	13	0D
Form feed	CTRL L	12	0C
Backspace	CTRL H	8	08
Color Text			
Black (default)	ESC&v0S	27 38 118 48 83	1B 26 76 30 53
Red	ESC&v1S	27 38 118 49 83	1B 26 76 31 53
Green	ESC&v2S	27 38 118 50 83	1B 26 76 32 53
Yellow	ESC&v3S	27 38 118 51 83	1B 26 76 33 53
Blue	ESC&v4S	27 38 118 52 83	1B 26 76 34 53
Magenta	ESC&v5S	27 38 118 53 83	1B 26 76 35 53
Cyan	ESC&v6S	27 38 118 54 83	1B 26 76 36 53
White (no text)	ESC&v7S	27 38 118 55 83	1B 26 76 37 53

(Table continues)

Print Feature	Escape Sequence or Control Code	ASCII Decimal Equivalent	ASCII Hexadecimal Equivalent
Automatic Line Termination			
Character received by printer: CR, LF, FF — Character(s) executed by printer: CR, LF, FF (default)	ESC&k0G	27 38 107 48 71	1B 26 6B 30 47
Character received by printer: CR, LF, FF — Character(s) executed by printer: CR,LF; LF; FF	ESC&k1G	27 38 107 49 71	1B 26 6B 31 47
Character received by printer: CR, LF, FF — Character(s) executed by printer: CR; CR,LF; CR,FF	ESC&k2G	27 38 107 50 71	1B 26 6B 32 47
Character received by printer: CR, LF, FF — Character(s) executed by printer: CR,LF; CR,LF; CR,FF	ESC&k3G	27 38 107 51 71	1B 26 6B 33 47
Cursor Positioning			
Move current horizontal position to new position on X-axis # is number of decipoints ± sign = relative move no sign = absolute move	ESC&a#H	27 38 97 __ 72	1B 26 61 __ 48
Move current vertical position to new position on Y-axis # is number of decipoints ± sign = relative move no sign = absolute move	ESC&a#V	27 38 97 __ 86	1B 26 61 __ 56
Symbol Sets			
Shift out to secondary set	CTRL N	14	OE
Shift in to primary set	CTRL O	15	OF
Designate printer default set as primary*	ESC(0@	27 40 48 64	1B 28 30 40
Designate printer default set as secondary	ESC)0@	27 41 48 64	1B 29 30 40
Designate primary default set as primary*	ESC(1@	27 40 49 64	1B 28 31 40
Designate primary default set as secondary	ESC)1@	27 41 49 64	1B 29 31 40
Designate current primary set as primary	ESC(2@	27 40 50 64	1B 28 32 40
Designate current primary set as secondary	ESC)2@	27 41 50 64	1B 29 32 40

*ESC(0@ and ESC(1@ perform the same function. Both access the power-up default set: Roman8 or PC-8.

(Table continues)

Print Feature	Escape Sequence or Control Code	ASCII Decimal Equivalent	ASCII Hexadecimal Equivalent
Symbol Sets (Continued)			
Designate default font as primary	ESC(3@	27 40 51 64	1B 28 33 40
Designate default font as secondary	ESC)3@	27 41 51 64	1B 29 33 40
Designate USASCII set as primary	ESC(0U	27 40 48 85	1B 28 30 55
Designate USASCII set as secondary	ESC)0U	27 41 48 85	1B 29 30 55
Designate Norwegian 1 set as primary	ESC(0D	27 40 48 68	1B 28 30 44
Designate Norwegian 1 set as secondary	ESC)0D	27 41 48 68	1B 29 30 44
Designate United Kingdom set as primary	ESC(1E	27 40 49 69	1B 28 31 45
Designate United Kingdom set as secondary	ESC)1E	27 41 49 69	1B 29 31 45
Designate French set as primary	ESC(1F	27 40 49 70	1B 28 31 46
Designate French set as secondary	ESC)1F	27 41 49 70	1B 29 31 46
Designate German set as primary	ESC(1G	27 40 49 71	1B 28 31 47
Designate German set as secondary	ESC)1G	27 41 49 71	1B 39 31 47
Designate Italian set as primary	ESC(0I	27 40 48 73	1B 28 30 49
Designate Italian set as secondary	ESC)0I	27 41 48 73	1B 29 30 49
Designate Swedish Names set as primary	ESC(0S	27 40 48 83	1B 28 30 53
Designate Swedish Names set as secondary	ESC)0S	27 41 48 83	1B 29 30 53
Designate Spanish set as primary	ESC(2S	27 40 50 83	1B 28 32 53
Designate Spanish set as secondary	ESC)2S	27 41 50 83	1B 29 32 53
Designate Roman8 as primary	ESC(8U	27 40 56 85	1B 28 38 55
Designate Roman8 as secondary	ESC)8U	27 41 56 85	1B 29 38 55
Designate ECMA-94 as primary	ESC(0N	27 40 48 78	1B 28 30 4E
Designate ECMA-94 as secondary	ESC)0N	27 41 48 78	1B 29 30 4E
Designate PC-8 as primary	ESC(10U	27 40 49 48 85	1B 28 31 30 55
Designate PC-8 as secondary	ESC)10U	27 41 49 48 85	1B 29 31 30 55

(Table continues)

Print Feature	Escape Sequence or Control Code	ASCII Decimal Equivalent	ASCII Hexadecimal Equivalent
Symbol Sets (Continued)			
Designate PC-8 (Danish/ Norwegian) as primary	ESC(11U	27 40 49 49 85	1B 28 31 31 55
Designate PC-8 (Danish/ Norwegian) as secondary	ESC)11U	27 41 49 49 85	1B 29 31 31 55
Designate downloadable font as primary # is ignored	ESC(#X	27 40 __ 88	1B 28 __ 58
Designate downloadable font as secondary # is ignored	ESC)#X	27 41 __ 88	1B 29 __ 58
Downloadable Characters			
Create RAM font	ESC)sW or	27 41 115 87	1B 29 73 57
# is number of bytes in the font descriptor block (not used)	ESC)s#W [font descriptor block]	27 41 115 __ 87	1B 29 73 __ 57
Set character code for downloadable character # is any number from 0–31, 33–255	ESC•c#E	27 42 99 __ 69	1B 2A 63 __ 45
Define downloadable character # is the code specified by ESC•c#E	ESC(s#W [character data]	27 40 115 __ 87	1B 28 73 __ 57
Delete RAM font # is 0 or 2	ESC•c#F	27 42 99 __ 70	1B 2A 63 __ 46
Raster Graphics			
Begin raster graphics # is 0 or 1; 0 sets left margin to left-most position; 1 sets left margin to current text position	ESC•r#A	27 42 114 __ 65	1B 2A 72 __ 41
End raster graphics # is ignored	ESC•r#B	27 42 114 __ 66	1B 2A 72 __ 42
Set resolution to 90 dpi (default)	ESC•t90R	27 42 116 57 48 82	1B 2A 74 39 30 52
Set resolution to 180 dpi	ESC•t180R	27 42 116 49 56 48 82	1B 24 74 31 38 30 52
Define image width # is the number of pixels per row	ESC•r#S	27 42 114 __ 83	1B 2A 72 __ 53

(Table continues)

Print Feature	Escape Sequence or Control Code	ASCII Decimal Equivalent	ASCII Hexadecimal Equivalent
Raster Graphics (Continued)			
Set data planes # is the number of data planes per row	**ESC * r # U**	27 42 114 _ 85	1B 2A 72 _ 55
Select transmission mode # is 0 or 1; 0 is unencoded transmission; 1 is run-length encoding	**ESC * b # M**	27 42 98 _ 77	1B 2A 62 _ 4D
Prepare printer to receive bytes that form one plane of raster graphics data # specifies number of data bytes that follow	**ESC * b # V** [data]	27 42 98 _ 86	1B 2A 62 _ 56
Prepare printer to receive bytes that form final plane of data transfer for each row # specifies number of data bytes that follow; used with **ESC * b # V** or used alone for black/white raster graphics	**ESC * b # W** [data]	27 42 98 _ 87	1B 2A 62 _ 57
Set color parameters to define a color # is a number within the following ranges:			
red (range: 4–90)	**ESC * v # A**	27 42 118 _ 65	1B 2A 76 _ 41
green (range: 4–88)	**ESC * v # B**	27 42 118 _ 66	1B 2A 76 _ 42
blue (range: 6–85)	**ESC * v # C**	27 42 118 _ 67	1B 2A 76 _ 43
Assign color defined by **ESC * v # A/B/C** # is the index number of the color palette	**ESC * v # I**	27 42 118 _ 73	1B 2A 76 _ 49
X-offset # defines horizontal offset in pixels	**ESC * b # X**	27 42 98 _ 88	1B 2A 62 _ 58
Y-offset # defines vertical offset in pixels	**ESC * b # Y**	27 42 98 _ 89	1B 2A 62 _ 59

B

Reference Tables of ASCII Characters

8-Bit Symbol Sets

The printer defaults to either the Roman8 set or the PC-8 set according to the switch setting on the rear panel.

PC-8 setting

Roman8 setting

NOTE: On an RS-232-C interface, do not attempt to access the upper half (decimal codes 128–255) of any 8-bit symbol set with the printer set to odd, even, or mark parity. Using parity clears the high bit of all bytes received by the printer. ■

The Roman8 set comprises the standard US ASCII set (printing characters are decimal codes 32–127) and Roman Extension, an 8-bit set of European characters and special symbols, (decimal codes 160–255). Of the nonprinting control codes, only decimal codes 8,10,12,13,14,15, and 27 are executed; the rest are ignored. Control codes are presented in the table on page B-5.

The lower half of the PC-8 set is the same as the US ASCII set, except that decimal codes 1–32 have special printing characters. The upper half is an 8-bit set containing some European symbols and graphic symbols for mathematics and line drawing. It can be used when printing characters available on IBM personal computers, or when running software packages that support the PC-8 set.

NOTE: If you attempt to print a character in the upper half of an 8-bit set when a 7-bit set is selected, the eighth bit is ignored and the respective character in the 7-bit set is printed.

The ECMA-94 and PC-8 (Danish/Norwegian) symbol sets also contain US ASCII in the lower half.

Roman8

Dec.		32	48	64	80	96	112	160	176	192	208	224	240
	Hex.	2	3	4	5	6	7	A	B	C	D	E	F
0	0		0	@	P	‘	p		¯	â	Å	Á	Þ
1	1	!	1	A	Q	a	q	À	Ý	ê	î	Ã	þ
2	2	"	2	B	R	b	r	Â	ý	ô	Ø	ã	·
3	3	#	3	C	S	c	s	È	°	û	Æ	Đ	µ
4	4	$	4	D	T	d	t	Ê	Ç	á	å	ð	¶
5	5	%	5	E	U	e	u	Ë	ç	é	í	Í	¾
6	6	&	6	F	V	f	v	Î	Ñ	ó	ø	Ì	‗
7	7	’	7	G	W	g	w	Ï	ñ	ú	æ	Ó	¼
8	8	(	8	H	X	h	x	´	¡	à	Ä	Ò	½
9	9	)	9	I	Y	i	y	`	¿	è	ì	Õ	ª
10	A	*	:	J	Z	j	z	^	¤	ò	Ö	õ	º
11	B	+	;	K	[	k	{	¨	£	ù	Ü	Š	«
12	C	,	<	L	\	l	|	~	¥	ä	É	š	■
13	D	-	=	M	]	m	}	Ù	§	ë	ï	Ú	»
14	E	.	>	N	^	n	~	Û	ƒ	ö	ß	Ÿ	±
15	F	/	?	O	_	o	▒	£	ç	ü	Ô	ÿ	

ECMA-94

Dec.		32	48	64	80	96	112	160	176	192	208	224	240
	Hex.	2	3	4	5	6	7	A	B	C	D	E	F
0	0		0	@	P	‘	p		°	À	Đ	à	ð
1	1	!	1	A	Q	a	q	¡	±	Á	Ñ	á	ñ
2	2	"	2	B	R	b	r	¢	²	Â	Ò	â	ò
3	3	#	3	C	S	c	s	£	³	Ã	Ó	ã	ó
4	4	$	4	D	T	d	t	¤	´	Ä	Ô	ä	ô
5	5	%	5	E	U	e	u	¥	µ	Å	Õ	å	õ
6	6	&	6	F	V	f	v	¦	¶	Æ	Ö	æ	ö
7	7	’	7	G	W	g	w	§	·	Ç	×	ç	÷
8	8	(	8	H	X	h	x	¨	¸	È	Ø	è	ø
9	9	)	9	I	Y	i	y	©	¹	É	Ù	é	ù
10	A	*	:	J	Z	j	z	ª	º	Ê	Ú	ê	ú
11	B	+	;	K	[	k	{	«	»	Ë	Û	ë	û
12	C	,	<	L	\	l	|	¬	¼	Ì	Ü	ì	ü
13	D	-	=	M	]	m	}		½	Í	Ý	í	ý
14	E	.	>	N	^	n	~	®	¾	Î	Þ	î	þ
15	F	/	?	O	_	o	▒	¯	¿	Ï	ß	ï	ÿ

The symbols in the PC-8 (Danish/Norwegian) set that differ from the symbols in the PC-8 set are shaded.

PC-8

Dec.		0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
	Hex.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0		►		0	@	P	‘	p	Ç	É	á	▒	└	╨	α	≡
1	1	☺	◄	!	1	A	Q	a	q	ü	æ	í	▓	┴	╤	β	±
2	2	☻	↕	"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3	3	♥	‼	#	3	C	S	c	s	â	ô	ú	▓	├	╙	π	≤
4	4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	▓	─	╘	Σ	⌠
5	5	♣	§	%	5	E	U	e	u	à	ò	Ñ	▓	┼	╒	σ	⌡
6	6	♠	▬	&	6	F	V	f	v	å	û	ª	▓	╞	╓	μ	÷
7	7	•	↨	’	7	G	W	g	w	ç	ù	º	▓	╟	╫	τ	≈
8	8	◘	↑	(	8	H	X	h	x	ê	ÿ	¿	▓	╚	╪	Φ	°
9	9	○	↓	)	9	I	Y	i	y	ë	Ö	⌐	▓	╔	┘	Θ	∙
10	A	◙	→	*	:	J	Z	j	z	è	Ü	¬	▓	╩	┌	Ω	·
11	B	♂	←	+	;	K	[	k	{	ï	¢	½	▓	╦	█	δ	√
12	C	♀	∟	,	<	L	\	l	|	î	£	¼	▓	╠	∞	η
13	D	♪	↔	–	=	M	]	m	}	ì	¥	¡	▓	═	▌	φ	²
14	E	♫	▲	.	>	N	^	n	~	Ä	₧	«	▓	╬	▐	ε	■
15	F	☼	▼	/	?	O	_	o	▒	Å	ƒ	»	▓	╧	▄	∩	

PC-8 (Danish/Norwegian)

Dec.		0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
	Hex.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0		►		0	@	P	‘	p	Ç	É	á	▒	└	╨	α	≡
1	1	☺	◄	!	1	A	Q	a	q	ü	æ	í	▓	┴	╤	β	±
2	2	☻	↕	"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3	3	♥	‼	#	3	C	S	c	s	â	ô	ú	▓	├	╙	π	≤
4	4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	▓	─	╘	Σ	⌠
5	5	♣	§	%	5	E	U	e	u	à	ò	Ñ	▓	┼	╒	σ	⌡
6	6	♠	▬	&	6	F	V	f	v	å	û	Õ	▓	╞	╓	μ	÷
7	7	•	↨	’	7	G	W	g	w	ç	ù	Ò	▓	╟	╫	τ	≈
8	8	◘	↑	(	8	H	X	h	x	ê	ÿ	¿	▓	╚	╪	Φ	°
9	9	○	↓	)	9	I	Y	i	y	ë	Õ	ã	▓	╔	┘	Θ	∙
10	A	◙	→	*	:	J	Z	j	z	è	Ü	Ã	▓	╩	┌	Ω	·
11	B	♂	←	+	;	K	[	k	{	ï	ø	ℓ	▓	╦	█	δ	√
12	C	♀	∟	,	<	L	\	l	|	î	£	‘n	▓	╠	∞	η
13	D	♪	↔	–	=	M	]	m	}	ì	Ø	¡	▓	═	▌	φ	²
14	E	♫	▲	.	>	N	^	n	~	Ä	Ł	³	▓	╬	▐	ε	■
15	F	☼	▼	/	?	O	_	o	▒	Å	ł	¤	▓	╧	▄	∩	

7-Bit Symbol Sets

In addition to US ASCII, the printer contains seven 7-bit international sets, shown below with their ISO registration number. These symbol sets are all very similar to characters in the lower half of the Roman8 set (decimal codes 0–127). The following table shows the differences between the international sets, US ASCII, and Roman8.

International Symbol Sets

Dec.	Hex.	US ASCII 6	Roman8	Norwegian 1 60	UK 4	French 69	German 21	Italian 15	Swedish Names 11	Spanish 17
35	23	#	#	#	£	£	#	£	#	£
36	24	$	$	$	$	$	$	$	¤	$
64	40	@	@	@	@	à	§	§	É	§
91	5B	[	[	Æ	[	°	Ä	°	Ä	¡
92	5C	\	\	Ø	\	ç	Ö	ç	Ö	Ñ
93	5D	]	]	Å	]	§	Ü	é	Å	¿
94	5E	^	^	^	^	^	^	^	Ü	^
96	60	‘	‘	`	`	µ	`	ù	é	`
123	7B	{	{	æ	{	é	ä	à	ä	°
124	7C	|	|	ø	|	ù	ö	ò	ö	ñ
125	7D	}	}	å	}	è	ü	è	å	ç
126	7E	~	~	¯	¯	¨	ß	ì	ü	~

The table on the next page lists the decimal, hexadecimal, and binary equivalents of the US ASCII characters.

ASCII Decimal-Hexadecimal-Binary Table

ASCII Char.	Equivalent Forms		
	Dec.	Hex.	Binary
NUL	0	00	00000000
SOH	1	01	00000001
STX	2	02	00000010
ETX	3	03	00000011
EOT	4	04	00000100
ENQ	5	05	00000101
ACK	6	06	00000110
BEL	7	07	00000111
BS	8	08	00001000
HT	9	09	00001001
LF	10	0A	00001010
VT	11	0B	00001011
FF	12	0C	00001100
CR	13	0D	00001101
SO	14	0E	00001110
SI	15	0F	00001111
DLE	16	10	00010000
DC1	17	11	00010001
DC2	18	12	00010010
DC3	19	13	00010011
DC4	20	14	00010100
NAK	21	15	00010101
SYNC	22	16	00010110
ETB	23	17	00010111
CAN	24	18	00011000
EM	25	19	00011001
SUB	26	1A	00011010
ESC	27	1B	00011011
FS	28	1C	00011100
GS	29	1D	00011101
RS	30	1E	00011110
US	31	1F	00011111

ASCII Char.	Equivalent Forms		
	Dec.	Hex.	Binary
space	32	20	00100000
!	33	21	00100001
"	34	22	00100010
#	35	23	00100011
$	36	24	00100100
%	37	25	00100101
&	38	26	00100110
'	39	27	00100111
(	40	28	00101000
)	41	29	00101001
*	42	2A	00101010
+	43	2B	00101011
,	44	2C	00101100
−	45	2D	00101101
.	46	2E	00101110
/	47	2F	00101111
0	48	30	00110000
1	49	31	00110001
2	50	32	00110010
3	51	33	00110011
4	52	34	00110100
5	53	35	00110101
6	54	36	00110110
7	55	37	00110111
8	56	38	00111000
9	57	39	00111001
:	58	3A	00111010
;	59	3B	00111011
<	60	3C	00111100
=	61	3D	00111101
>	62	3E	00111110
?	63	3F	00111111

(Table continues)

ASCII Decimal-Hexadecimal-Binary Table (Continued)

ASCII Char.	Equivalent Forms		
	Dec.	Hex.	Binary
@	64	40	01000000
A	65	41	01000001
B	66	42	01000010
C	67	43	01000011
D	68	44	01000100
E	69	45	01000101
F	70	46	01000110
G	71	47	01000111
H	72	48	01001000
I	73	49	01001001
J	74	4A	01001010
K	75	4B	01001011
L	76	4C	01001100
M	77	4D	01001101
N	78	4E	01001110
O	79	4F	01001111
P	80	50	01010000
Q	81	51	01010001
R	82	52	01010010
S	83	53	01010011
T	84	54	01010100
U	85	55	01010101
V	86	56	01010110
W	87	57	01010111
X	88	58	01011000
Y	89	59	01011001
Z	90	5A	01011010
[	91	5B	01011011
\	92	5C	01011100
]	93	5D	01011101
^	94	5E	01011110
—	95	5F	01011111

ASCII Char.	Equivalent Forms		
	Dec.	Hex.	Binary
	96	60	01100000
a	97	61	01100001
b	98	62	01100010
c	99	63	01100011
d	100	64	01100100
e	101	65	01100101
f	102	66	01100110
g	103	67	01100111
h	104	68	01101000
i	105	69	01101001
j	106	6A	01101010
k	107	6B	01101011
l	108	6C	01101100
m	109	6D	01101101
n	110	6E	01101110
o	111	6F	01101111
p	112	70	01110000
q	113	71	01110001
r	114	72	01110010
s	115	73	01110011
t	116	74	01110100
u	117	75	01110101
v	118	76	01110110
w	119	77	01110111
x	120	78	01111000
y	121	79	01111001
z	122	7A	01111010
{	123	7B	01111011
|	124	7C	01111100
}	125	7D	01111101
~	126	7E	01111110
DEL	127	7F	01111111

C

Parallel Interface Information

This appendix contains information about a standard parallel interface compatible with many personal computers.

Printer Connector Pin Assignments

In the table below, the second number in the Pin No. column refers to a ground wire that is twisted with the signal wire.

Pin No.*	Signal	Source	Description
1, 19	STROBE	Computer	A low pulse of 0.5 μs causes the printer to read one byte of data.
2, 20	DATA1	Computer	Data bit 0
3, 21	DATA2	Computer	Data bit 1
4, 22	DATA3	Computer	Data bit 2
5, 23	DATA4	Computer	Data bit 3
6, 24	DATA5	Computer	Data bit 4
7, 25	DATA6	Computer	Data bit 5
8, 26	DATA7	Computer	Data bit 6
9, 27	DATA8	Computer	Data bit 7
10, 28	ACKNLG	Printer	The printer sends a low pulse to indicate it has accepted a byte of data and is ready for more data, or that it has completed a function.
11, 29	BUSY	Printer	A high logic level indicates the printer can't receive data due to data entry, full buffer, or error status.

*Pins 14, 15, 18, 34, 35, and 36 are not used.

(Table continues)

Pin No.*	Signal	Source	Description
12	Out of Paper	Printer	A high logic level indicates the printer is out of paper.
13	SLCT	Printer	Always high. Indicates the printer is selected.
16	SIG GND		
17	CHS GND		
31, 30	INIT	Computer	A low pulse of 0.5 μs resets the printer to power-up conditions.
32	ERROR	Printer	A low level indicates a motor or self-test failure.
33	SIG GND		

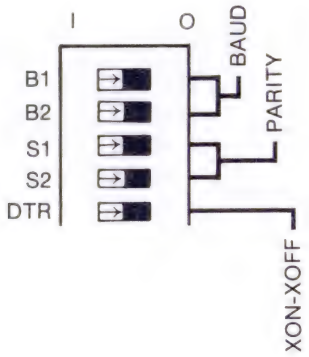
*Pins 14, 15, 18, 34, 35, and 36 are not used.

D

RS-232-C/CCITT V.24 Interface Information

The RS-232-C* interface is a standard serial interface compatible with many computers and terminals. This appendix provides a summary of RS-232-C interface specifications.

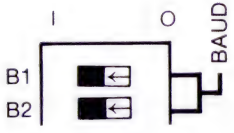
The following figure shows the RS-232-C switch configuration when the printer is shipped.



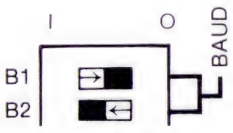
*All references to the RS-232-C interface apply equally to the RS-232-C and CCITT V.24 interfaces. The term RS-232-C is used for simplicity.

Baud Rate Options

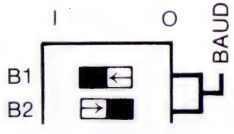
Select baud rate using the **B1** and **B2** switches on the printer's rear panel. Following are the switch settings of the four possible baud rates.



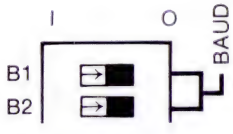
Baud rate = 1200



Baud rate = 2400



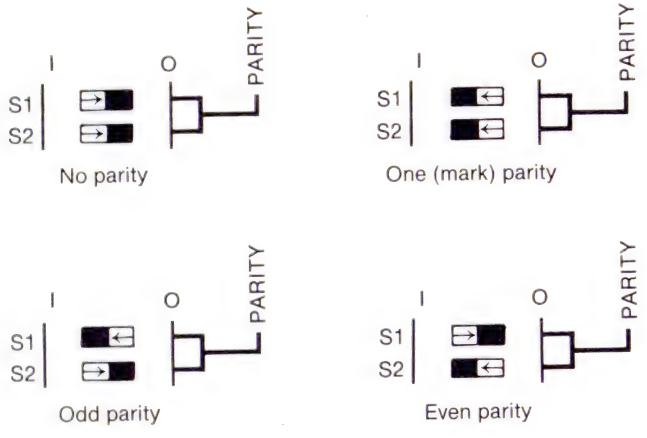
Baud rate = 4800



Baud rate = 9600

Parity Options

Select parity using the **S1** and **S2** parity switches on the printer's rear panel. Following are the parity switch settings.



NOTE: Do not attempt to print raster graphics with the printer set to odd, even, or mark parity. Employment of odd, even, or mark parity clears the high bit of all bytes received by the printer. Clearing the high bit prevents accurate transmission of raster graphics data.

Also, **do not attempt to access the upper half (decimal codes 128-255) of any 8-bit character set with the printer set to odd, even or mark parity**, since the high bit will be cleared. ■

Stop Bit

The printer will always send one stop bit, regardless of baud rate.

Pin Assignments on the RS-232-C Printer Connector

The following figure shows the pin assignments for the printer's connector. "Input" means that the signal is received by the printer from the computer. "Output" means that the signal is transmitted from the printer to the computer.

Pin No.	Wire/Signal Name	RS-232-C	CCITT V.24	Direction
1	Protective Ground (shield)	AA	(101)	
2	Transmitted Data	BA	(103)	Output
3	Received Data	BB	(104)	Input
4	Request to Send (RTS)	CA	(105)	Output
7	Signal Ground	AB	(102)	
20	Data Terminal Ready (DTR)	CD	(108.2)	Output

Protective Ground: Ground line to connect to the cable shield.

Transmitted Data: Line on which bit-serial data is transmitted to the computer system or terminal from the printer. Used with XON-XOFF handshaking.

Received Data: Line on which bit-serial data is transmitted to the printer from the computer system or terminal.

Request to Send: A signal output from the printer which is always high ($\geq = +3V$) when the printer has been turned on from the front panel.

Data Terminal Ready: A signal output from the printer that indicates whether or not it has room in its buffer for data. When the buffer has room for more data, this line is high ($\geq = +3V$). When the buffer is full or almost full, this line is low ($\leq = -3V$).

Handshake Modes

Handshaking is a process in which the computer and printer exchange signals to prevent the printer's buffer from overflowing and losing data.

Either an XON-XOFF handshake or a hardwire handshake using pin 20 (DTR) can be selected. The handshake you select will depend on which type handshake your computer terminal or software uses.

Select the handshake mode by setting the **DTR/XON-XOFF** switch on the printer's rear panel. Turn the printer off before changing the switch.

XON-XOFF Handshake

When the printer is turned on, it sets the DTR and RTS lines active and sends an XON character (ASCII character DC1) to the computer. The computer can now begin sending data to the printer.

When the printer's buffer has room for only 128 more bytes, the printer sends the computer an XOFF character (ASCII DC3) to stop data transmission. If data is still received after the first XOFF character is sent, the printer will send a second XOFF character when the buffer has room for only 64 more bytes.

After sending the XOFF character, the printer will continue to print, thus making more room in its buffer. When the buffer has space remaining for 255 bytes, the printer will send an XON character.

When the printer is turned off (but the power supply is still plugged in), the DTR and RTS lines are set low ($\leq = -3V$).

Hardwire Handshake (Data Terminal Ready)

Unlike the XON-XOFF handshake, which uses ASCII characters to convey information about the availability of buffer space, the hardwire handshake uses pin 20, DTR, on the connector to convey this information. The voltage level on this pin indicates whether or not buffer space is available.

When the printer is turned on from the front panel, it sets the DTR and RTS lines high ($\geq = +3V$). The printer holds the DTR line high until it has room in its buffer for only 128 more bytes. It will then set the line low ($\leq = -3V$), indicating that its buffer is almost full. A computer using this handshake monitors this line; when the printer's DTR line goes low, the computer stops sending data.

When the printer has processed some of its data and the buffer has room for 255 more data bytes, the DTR line is set high again. The computer monitoring this line will resume sending data.

When the printer is turned off (but the power supply is plugged in), both the DTR and RTS lines are set low ($\leq = -3V$).

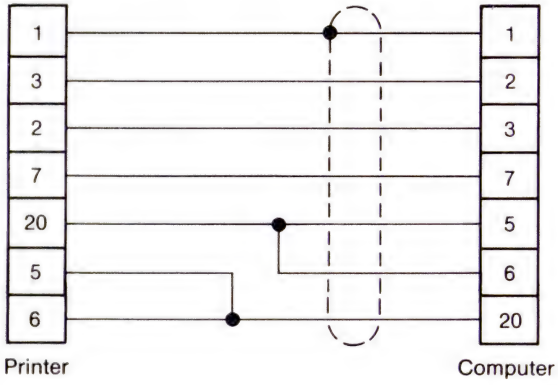
RS-232-C Cable Schematics

The following cable schematics are for Hewlett-Packard cables.

Modem Eliminator Cable

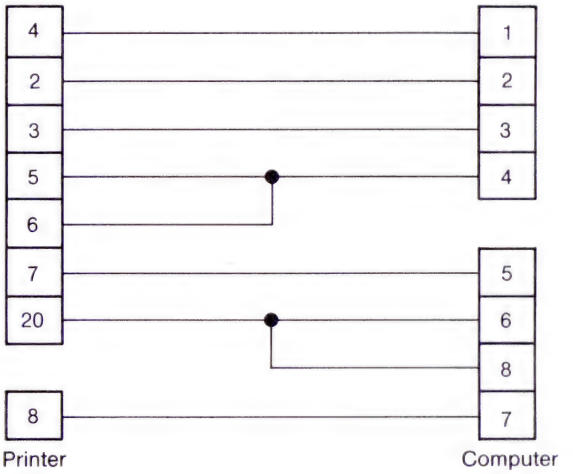
HP Cable Number	Connector Type (25-Pin)	
	Printer End	Computer End
17255D	Male	Female
17255M or 13242G* or 13242-60010	Male	Male

*Symmetrical; either end may be connected to the printer. Additional pins are connected in the 13242G and 13242-60010 but they do not affect communications.

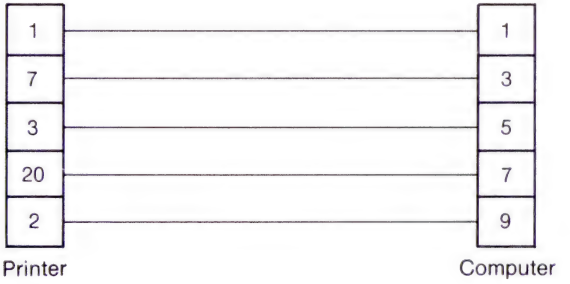


Serial Printer/Plotter Cables

HP Cable Number	Connector Type	
	Printer End	Computer End
24542G	Male (25-pin)	Female (9-pin)



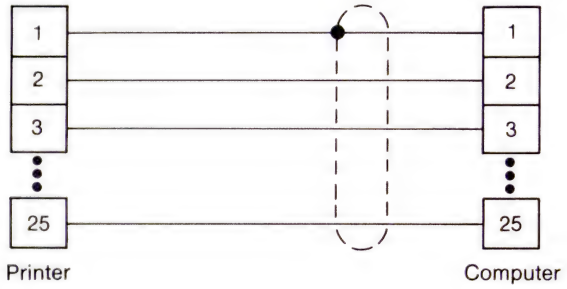
HP Cable Number	Connector Type	
	Printer End	Computer End
92219M	Male (25-pin)	Male (9-pin)



Straight-through Cable

HP Cable Number	Connector Type (25-Pin)	
	Printer End	Computer End
17355M*	Male	Male

*Symmetrical; either end may be connected to the printer.



(pins 1–25 are directly connected)

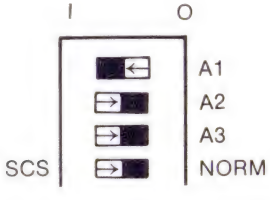
E

HP-IB (IEEE-488) Information

The Hewlett-Packard Interface Bus (HP-IB) provides for compatibility between all devices adhering to the ANSI/IEEE-488 (1978) standard. HP-IB is the most common interface between Hewlett-Packard computers, peripherals and instruments. This appendix explains how to set the printer's switches for the address code and for implementation of normal or secondary command support.

Much of the information is for advanced applications. Most printer users will not need to refer to this information.

Following is the HP-IB switch configuration when the printer is shipped.



Interface Modes: Normal or Secondary Command Support

Two command modes are available on the printer — the standard (normal) HP-IB mode and secondary command support. To change command mode, turn off the printer and set the **SCS/NORM** switch on the printer's rear panel.

Standard HP-IB setting

Secondary Command Support setting

The following table shows what functions are implemented according to the mode selected.

Interface Function Name	Normal Implementation	SCS Implementation
Source Handshake	SH1	SH1
Acceptor Handshake	AH1	AH1
Talker	T6	—
Listener	L3	—
Extended Talker	—	TE6
Extended Listener	—	LE4
Service Request	SR1	—
Parallel Poll	PP2 or PP0*	PP2
Device Clear	DC1	DC1
No Remote Local	RL0	RL0
No Device Trigger	DT0	DT0
No Controller	C0	C0

*PP2 if address $\leq$ 6, PP0 if listen-only mode.

Normal HP-IB Protocol

This is the standard implementation of HP-IB that establishes mechanical, electrical, timing, and data compatibility between devices. It allows high-speed communication between many peripherals on one computer port. A device on the HP-IB may function in the following ways.

- a "listener" that receives data sent over the bus
- a "talker" that transmits data to other devices on the bus
- a "controller" (computer) that regulates interaction of the devices on the HP-IB system

The printer functions primarily as a "listener," receiving data sent over the bus.

Using HP-IB addresses, the controller can identify and individually access various devices on the interface. Select the HP-IB address using the rear-panel address switches. Addresses 0 through 6 implement standard HP-IB support; address 7 implements listen-only mode. The printer is set to an address code of 1 before shipment.

The following table lists the available address switch positions for each value.

A3	A2	A1	HP-IB Address (Decimal)	
0	0	0	0	
0	0	1	1	← Preset
0	1	0	2	
0	1	1	3	
1	0	0	4	
1	0	1	5	
1	1	0	6	
1	1	1	7	← Listen-Only Mode

Listen-Only Mode

In listen-only mode, the printer will print all data transmitted over the bus without having to be addressed by a computer.

To activate listen-only mode, turn the printer off and set all the rear-panel address switches to 1 as shown in the following illustration.

NOTE: Listen-only mode is disabled if Secondary Command Support is selected for the printer. ■

Serial and Parallel Polling

Serial and parallel polling are processes used by the controller to determine if any of the devices (such as printers and plotters) on the HP-IB bus require service. Like most HP-IB devices, the printer can also request service.

Serial Polling

Refer to your computer's documentation to determine whether or not your system has serial poll capability, and for the necessary (enable/disable) commands.

In a serial poll, the computer polls the devices on the bus, one at a time, in sequence. The computer requests the status of one specific device by addressing only that device and asking it to respond. The printer responds to the request by sending a status byte. The definition of each bit in the status byte is shown in the following table.

Status Byte		
Bit	**Bit Value When Set**	**Condition Indicated When Bit Set to 1**
0 (least significant)	1	Carriage or paper motion disabled
2	4	Out of paper
6	64	Request for service
1, 3, 4, 5, 7 (always disabled)		

When carriage/paper motion is disabled or the printer is out of paper, the printer will set bit 0 or 2, respectively, of the status byte. It will also set bit 6 to assert a service request.

A service request is terminated when the status byte is read or the condition is corrected—loading paper or restoring normal carriage motion. Bit 6 is cleared (set to 0) at this time.

Use an interrupt routine to halt the program when the computer receives a service request. Then, send a serial poll to determine which device on the line needs service. Sending a serial poll clears bit 6 of the status byte.

NOTE: The printer cannot respond to a serial poll when it is in either listen-only mode or secondary command support mode. ■

Parallel Polling

Refer to your computer's documentation to determine if your system has parallel polling capability and for the necessary (enable/disable) commands.

Parallel polling provides a fast way for the computer to determine which, if any, of the devices on the bus needs service. The computer performs a parallel poll by asserting the EOI (End or Identify) and ATN (Attention) lines simultaneously. If it requires service, the printer will respond by asserting its assigned DI/O line.

If the printer's address is 0 through 6, refer to the following table to see which HP-IB data line will be used for responding to a parallel poll. In listen-only mode (HP-IB address 7), the printer cannot respond to a parallel poll.

Printer Address	Parallel Poll Bit		HP-IB Data Line Number	
	Position	Value		
0	7	128	8	
1	6	64	7	← Preset
2	5	32	6	
3	4	16	5	
4	3	8	4	
5	2	4	3	
6	1	2	2	

When enabled in normal HP-IB mode, the printer will respond to a parallel poll when it is out of paper or the carriage motion is disabled. Eliminating the cause (loading paper, for example) will terminate the printer's response.

When enabled in SCS mode, the printer will respond to a parallel poll under the following conditions: ready for data, carriage motion disabled, self-test failure, and out of paper. Eliminating the cause (loading paper, for example) will terminate the response.

Bus Commands

Devices on the HP-IB receive special instructions in the form of commands. To send a command over the bus, the controller asserts the ATN line. Once the ATN line is asserted, the devices on the bus understand that what follows is a command, not data.

Listen Address (LAD) X01AAAAA

AAAAA represents the HP-IB address of the device for which the command is intended. This command causes the printer to become a listener.

Device Clear (DCL) X0010100

The Device Clear has no effect on the printer. When it receives a DCL, the printer is instructed to return to a known state and clear any pending output to the controller. The printer has no output commands and therefore no commands to clear.

Selected Device Clear (SDC) X0000100

This command clears only those devices on the bus that are selected to listen. Except for this difference, SDC has the same effect as DCL.

Interface Clear (IFC)

The controller uses the IFC line to override all bus operations and return the bus to a known inactive state. All pending output on the bus is cleared.

Secondary Command Support

Your system must support secondary commands in order for the printer to function in this mode. Secondary command support extends the capabilities of normal HP-IB protocol. Implementation of secondary commands avoids HP-IB lock-up in a multi-user environment.

When this protocol is selected, listen-only mode and the service request are automatically disabled. The printer can be identified with addresses 0 through 7.

Secondary commands have a two-byte structure to carry their more detailed instructions. The printer functions as Extended Talker or Extended Listener. The first byte is always a primary talk or listen command, which sets up the second byte as a more specific talk or listen instruction.

The printer supports four secondary commands, two talk and two listen.

Secondary Talk Commands

Device Specified Jump (DSJ) X1110000

When the printer receives the primary talk command followed by a secondary DSJ command, it will respond with one byte of data with the EOI line asserted. The value of the byte will be decimal zero, one, or two.

Decimal Value of Response Byte	Printer Status
0	Ready to receive
1	Ready to send
2	Status change (power cycle, out of paper, or carriage/ paper motion failure)

I/O Status X1101110

The I/O status is a means by which the controller checks the current printer status. When the printer receives the primary talk command followed by the secondary I/O status command, it will respond with one byte of data with the EOI line asserted. Bits 2 through 5 of the status byte are undefined. If the printer shuts down, bits 6 and 7 of the status byte are cleared.

Bit	Bit Value When Set	Printer Status
0	1	Power cycle
1	2	Out of paper
2–5	—	Undefined
6	64	Ready for data
7	128	On line

Unrecognized Secondary Talk Commands

When the printer receives a secondary talk command that it does not recognize, it will respond by sending a null byte (00000000) with the EOI line asserted.

Secondary Listen Commands

Device Clear X1110000

This performs the same function as a DCL and has no effect on the printer. The printer has no output commands and therefore no commands to clear. Device clear is followed by a required parity byte, used by other devices, which the printer ignores.

Data X1100000

This command tells the printer that bytes following the command contain data to be printed. For maximum throughput, the printer should receive data bursts of 32 bytes (or less) in length. A burst length that exceeds 32 bytes may be processed at a slightly reduced rate.

Unrecognized Secondary Listen Commands

When the printer receives a secondary listen command that is does not recognize, it will still acknowledge the command as valid. It then reads but ignores all incoming data bytes until it receives an Unlisten command or a data byte with the EOI asserted.

Identify Command Sequence

This command is used by the controller to identify devices on the bus and determine their characteristics. When the printer receives a primary untalk command followed by a secondary identify command specifying the printer's address in the lowest three bits, it will respond with two data bytes. The first byte is a general device classification which tells the controller that the printer is a printer/terminal device. The second byte tells the controller that the printer is an HP 3630A. The response bytes are shown below.

Byte 1	(printer/terminal)	00100000	(20 hex)
Byte 2	(HP 3630A designator)	00001110	(0E hex)

F

Specifications

Functional Specifications

Print Rate	16.7 inches/second 167 characters/second at 10 cpi 200 characters/second at 12 cpi 300 characters/second at 18 cpi
Line Length (8 inches)	80 characters at 10 cpi 96 characters at 12 cpi 144 characters at 18 cpi
Symbol Sets	Roman8 PC-8 US ASCII Spanish French PC-8 (Danish/Norwegian) German Italian United Kingdom Norwegian 1 Swedish Names ECMA-94
Fonts	Courier: 12 point (10 cpi) Letter Gothic: 12 point (12 cpi) 8 point (18 cpi)
Form Feed Rate	8 seconds per 11-inch page
Print Modes	Unidirectional and bidirectional text printing Unidirectional color printing Transparency printing

(Table continues)

Media Sizes	CutSheet Paper: 210 × 297 mm 8.5 × 11 in. Z-fold Paper: 210 × 304.8 mm 8.5 × 11 in. Single Sheet Film: 210 × 297 mm 8.5 × 11 in.
Dot Spacing	180 dpi, horizontal and vertical
Dot Size	0.0085 inch
Text Colors	Black Red Yellow Green Magenta Blue Cyan
Character Buffer	.5–8 K characters (depending on whether downloadable characters are in use)

Environmental Specifications

Operating Temperature	15° to 30°C (60° to 86°F)
Operating Relative Humidity	paper: 20 to 80% (at 15° to 30°C) film: 20 to 70% (at 15° to 30°C)
Storage Temperature	−40° to 70°C (−40° to 158°F)

Physical Specifications

Size	depth: 302 mm (11.89 in.) width: 442 mm (17.40 in.) height: 98 mm (3.86 in.)
Weight	5 kg (11 lb.)

Power Specifications

Source	100, 120, 220, 240 V~ ±10%
Frequency	48 to 66 Hz
Consumption	20 W maximum

Power Module Options

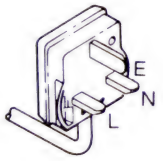
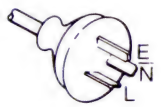
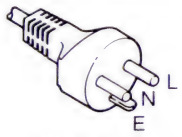
The power module/cord supplied with your printer should match the plug requirement for your area. However, power cords with different plugs (international options) are available and are shown in the following chart. If you wish to use a different power module/cord, contact your local Hewlett-Packard dealer or Sales and Support Office.

Power Module Options

AC Plug Type*	AC Voltage	Country	HP Model Number
NEMA 5-15P	100 V	Japan Korea	17322B
	120 V	United States Canada Philippines Mexico Taiwan	17122B
CEE 7-VII	220 V	East and West Europe Saudi Arabia Egypt Spain	17222B
SABS 164	220 V	Libya India South Africa	17622B

(Table continues)

F

AC Plug Type*	AC Voltage	Country	HP Model Number
 BS 1363A	240 V	Sudan Singapore Cyprus United Kingdom	17422B
 ASC112	220 V	Papua New Guinea People's Republic of China Argentina Uraguay	17922B
	240 V	Australia New Zealand	17722B
 SEV 1011	220 V	Switzerland	17522B
 DHCK-107	220 V	Denmark	17822B

*L = Line or Active Conductor (also called "live" or "hot")
N = Neutral or Identified Conductor
E = Earth or Ground

G

Ordering Supplies

This appendix lists the supplies available for the printer and tells you how to order them.

Printer Supplies

The following items can be ordered from Hewlett-Packard by using the appropriate part number. Ordering information follows this listing.

Item		HP Part Number
Black print cartridge		51606A
Color print cartridge		51606C
HP PaintJet Paper — English		
Z-fold (8.5 × 11 in.) (216 × 279.4 mm)	250 sheets	51630P
CutSheet (8.5 × 11 in.) (216 × 279.4 mm)	250 sheets	51630Y
HP PaintJet Paper — Metric		
Z-fold (210 × 304.8 mm)	250 sheets	51630R
CutSheet (210 × 297 mm)	250 sheets	51630Z

(Table continues)

Item	HP Part Number
HP PaintJet Film	
Single Sheet (8.5 × 11 in.) (216 × 279.4 mm) 50 sheets	51630Q
Single Sheet (210 × 297 mm) 50 sheets	51630S
HP PaintJet User's Guide	03630-90001
HP PaintJet Hardware Support Manual (service manual)	03630-90000
Printer stand	92269A
Dust cover	92250Z
HP-IB shielded cable (IEEE 488-1978) (for use with HP Touchscreen, HP Series 200, HP Series 300 and other HP computers)	10833A (1 m), B (2 m), C (4 m) or D (.5 m)
RS-232-C shielded cable (for use with IBM PC, IBM PC-XT, and AT&T PC 6300)	17255D (1.2 m)
RS-232-C shielded cable (for use with HP Touchscreen and HP Vectra*)	17255M (1.2 m) or 13242G (5 m) or 13242-60010 (5 m)
RS-232-C shielded cable (for use with HP Vectra** and IBM AT	24542G (3 m)
RS-232-C shielded cable (for use with Apple Macintosh and Macintosh Plus)	92219M (1.5 m)
Parallel shielded cable (for use with HP Touchscreen)	13242D (2 m)
Parallel shielded cable (for use with HP Vectra***, IBM PC, IBM PC-XT, IBM AT and AT&T PC 6300)	92219K (2.7 m)

*Requires HP 24541A Dual Serial Interface Card.

**Requires HP 24540A Serial/Parallel Interface Card or HP 24541A Dual Serial Interface Card.

***Requires HP 24540A Serial/Parallel Interface Card.

How to Order Supplies

You can order printer supplies in any of these three ways:

1. Call your local authorized HP dealer.
2. Contact your local HP Sales and Support Office.
3. Use HP's Direct Order telephone service. Telephone numbers for many locations follow.

For a complete list of Hewlett-Packard supplies and accessories, order the *Computer User's Catalog* (Part No. 5953-2450). You can obtain one by calling one of the numbers below, or by asking at your local HP Sales and Support Office.

Location	Telephone Number
United States	(800) 538-8787
Australia	(03) 895-2615 (03) 895-2645 (03) 895-2815 (03) 895-2861
Austria	(0222) 2500-614 (0222) 2500-615 (0222) 2500-616
Belgium/Luxembourg	(02) 761 31 11
Canada	
Atlantic Provinces	1-800-387-3154
Ontario & Quebec	1-800-387-3417
Toronto	(416) 671-8383
The West	1-800-387-3154
Denmark	04-30-16-40
Finland	(90) 887 2361
France	(1) 69 28 32 64
Greece	(01) 6726090
Italy	(02) 9236 9702

(Table continues)

Location	Telephone Number
Japan	
Sagamihara	0427 59 1311
Osaka	06 304 6021
Middle East/Athens	(01) 6828811
Norway	(02) 24 60 90
South Africa	
Johannesburg	(011) 8025111
Cape Town	(021) 537954
Spain	(91) 6374013 (91) 6370011
Sweden	(08) 7502400
Switzerland	(057) 31 22 53 (057) 31 22 54 (057) 31 22 59
The Netherlands	(020) 547 6606
United Kingdom	(0734) 697201
West Germany	(0130) 3322

Glossary

ASCII (American Standard Code for Information Interchange) An 8-bit code that uses 7 bits to represent character data such as letters, punctuation, symbols, and control characters. The eighth bit can be used for parity.

ASCII Control Character See *Control Character*.

Address The address specifies the printer's location on the HP-IB (IEEE-488) interface (bus). Refer to Appendix E.

Baud Rate For an RS-232-C interface, the data transmission rate between a computer and a peripheral. Is sometimes, but not always, the same as bits per second.

Bit Binary digit; a bit represents an "on" or "off" electrical condition. It is the smallest unit of digital information used by a computer or peripheral device.

Buffer A part of the computer's or printer's memory where data for input or output is held until it can be processed.

Bus In this manual, short for HP-IB (IEEE-488) interface.

Byte A unit of information consisting of eight bits.

Carriage The movable unit that holds the print cartridges.

Character Set See *Symbol Set.*

Configuration The way in which computer equipment is interconnected and set up to operate as a system. Hardware configuration can be changed by changing switch settings. Software configuration can be changed by entering new data or setup strings.

Control Character A nonprinting ASCII character (decimal codes 0–32 and 127) that starts, modifies, or stops a device function. Control functions affect data processing, transmission, or interpretation. Carriage returns and line feeds are examples of control functions.

Control Code An instruction that tells the printer to perform a specific function.

CPI Characters per inch, or pitch. Describes the number of characters that will print within one horizontal inch. For example, PaintJet can print at 10, 12, and 18 cpi.

Cut Sheet Paper Paper that is hand-loaded into the printer one sheet at a time. Also known as sheet-feed or single-sheet paper.

Data Byte The basic unit of data sent to the printer by the computer. For this printer, data bytes consist of eight bits.

Decimal Code A representation of a character (ASCII) by the decimal equivalent of its 7- or 8-bit binary code. Refer to the ASCII tables in Appendices A and B.

Decipoint — A unit of measure that equals 1/720 of an inch. The printer can move the cursor position in increments of 4 decipoints (1/180 inch).

Default — A value or condition that is assumed when the printer is powered on.

DPI — Dots per inch, the resolution of raster images on the printer. PaintJet prints raster images at either 90 (default) dpi or 180 dpi.

Escape Sequence — A string of characters, beginning with the escape character (decimal 27 in ASCII), that invoke one of the printer's features, such as bold or underlining.

Font — A set of characters of a specific symbol set, pitch, point size, stroke weight, and typeface.

HP-IB — Short for Hewlett-Packard Interface Bus.

HP-IB Interface — Hewlett Packard's version of the IEEE Standard 488-1978 for interfacing programmable devices (for example, computers, plotters, and printers). Refer to Appendix E.

Handshake — A method of communication between a computer and printer concerning the availability of buffer space (memory) in the printer. A handshake ensures correct and complete data transfer.

Hexadecimal — Numbers represented to the base 16 (where digits are 0–9 and A,B,C,D,E,F). Frequently used in programming and referred to as "hex."

Input/Output (I/O) — Relates to the equipment or method used for transmitting information between (to and from) devices, or the information itself.

Interface — 1. To join components of a computer system so they function in a compatible manner. 2. A term applied to hardware used to do this (interface cable, interface card, etc.). 3. Standards that allow systems to connect to each other, such as parallel, HP-IB, and RS-232-C.

Interface Cable — The data transmission cable used to connect a peripheral device to a computer. The cable's wiring depends on the computer, device, and interface standard (RS-232-C, HP-IB, or parallel) being used.

Logical Page — In page formatting, the combined text area and perforation skip area. See *Perforation Skip* in Chapter 4.

LPI — Lines per inch. PaintJet can print at 6, 8, or 9 lpi.

Nozzle Plate — On a print cartridge, the gold plate containing the nozzles through which tiny drops of ink are propelled.

Palette — A selection of colors available for printing at any one time. The text palette has 7 colors and cannot be changed. The default graphics palette has 16 colors, but any 16 colors can be assigned to the palette from over 325 available colors.

Paper Bail — The bar that holds the paper against the roller.

Parallel Interface — A type of interface that uses separate lines to simultaneously transmit each data bit in a byte. Refer to Appendix C.

Parity — For RS-232-C, an error-checking method for information transfer between a computer and a peripheral device. Parity can be used to check the accuracy of a binary data byte (character).

Peripheral (device) A device separate from, but used with, a computer. For example, a disc drive, printer, or plotter.

Pitch The number of characters that can be placed in a horizontal inch of text. This printer will print 10, 12, and 18 characters per inch.

Pixel PIcture ELement. The individual dots of a row/column matrix that form a picture.

Prime To prepare the print cartridge for use by clearing any air bubbles that prevent ink flow through the nozzle plate.

Print Cartridge The casing that holds the ink used in printing. On PaintJet, one print cartridge contains black ink and one print cartridge contains colored ink (cyan, magenta, and yellow).

RS-232-C Interface A serial interface standardized by an Electronic Industries Association Standard.

Raster A rectangular matrix of pixels, where each pixel is defined by a bit. A bit that is "on" will print a dot on the paper (or light a pixel on the screen). A bit that is "off" will leave the area blank.

Raster Mode A mode of raster graphics printing. Once the printer is in raster mode, the left graphics margin and the graphics resolution cannot be changed.

Resolution A measure of image sharpness expressed as number of dots per inch (dpi).

Symbol Set

A group of characters, each of which is defined by a unique ASCII binary code. Typically, a symbol set contains related characters, such as a set composed of math symbols, or characters in a foreign language..

Top of Form

The line on the page where printing can begin; the first line after the top margin.

Wiper

The unit (on the carriage lid) that is used for wiping paper dust and excess ink off the print cartridges.

Z-fold Paper

Perforated sheets of paper that stack in a Z-pattern. The paper also has vertical strips with sprocket holes that the printer uses to advance the paper. Also called continuous-form paper, fan-fold paper, or pin-feed paper.

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PART NO. 03630-90001

PRINTED IN U.S.A., NOVEMBER 1987